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[TITLE OF THE INVENTION]    INFORMATION DISTRIBUTION SERVICE SYSTEM BASED ON PREDICTED CHANGES IN LOCATION OF MOBILE INFORMATION TERMINAL

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[Title of the Invention]  Information Distribution Service

System Based on Predicted Changes in Position of Mobile

Information Terminal

[What is Claimed is]

  [Claim 1] An information distribution service system

comprising a plurality of mobile information terminals, a

computer system and a plurality of information-provider

terminals wherein said mobile information terminals, said

computer system and said information-provider terminals

are connected to each other by a communication network,

said information distribution service system

characterized in that:

        said computer system predicts a mobile information

terminal's moving destination and moving direction by

inferring said mobile-information terminal's positional

displacements along the time axis on the basis of

information on positions of said mobile information

terminal including a pre-registered information category

whose information distribution service, distribution and

notification are desired, and on the basis of an

inference formula provided in advance with said mobile

information terminal's moving direction and position; and

        said computer system determines an information-

provider terminal predicted to exist at said predicted

moving destination of said mobile information terminal on

the basis of locations of information-provider terminals

pre-recording plans to distribute information as a

notification, and determines distributed and reported

information corresponding to an information category

registered in advance by said mobile information terminal

among pieces of information to be provided by said

selected information-provider terminal.

[Claim 2]  An information distribution service system

according to claim 1, said information distribution

service system characterized in that, if it is impossible

to determine an inference formula for predicting said

mobile information terminal's moving direction and

position from positional displacements of said mobile

information terminal with each geographical position used

as an origin on the basis of map information, said

computer system finds an inference formula for predicting

said mobile information terminal's most recent moving

destination and most recent moving direction each time

most recent information on a position of said mobile

information terminal is obtained.

[Claim 3]  An information distribution service system

according to claim 1, said information distribution

service system characterized in that, if an inference formula, which is found as an equation for predicting said mobile information terminal's moving destination and moving direction each time most recent information on a position of said mobile information terminal is obtained, changes very frequently in a time series, said computer system predicts a polarity of a movement of said mobile information terminal by application of a partial derivative and on the basis of said mobile information terminal's positional information accumulated in the past.

[Claim 4] An information distribution service system according to claim 1, said information distribution service system characterized in that said computer system executes the steps of:

regarding said defined inference formula as an equation representing a regression straight line;

finding a distance between a position represented by said inference formula and the location of said information-provider terminal by adoption of a least-square method; and

determining that an information-provider terminal exists in the vicinity of said predicted moving destination of said mobile information terminal if said distance is in an allowable range determined for said

defined inference formula.

[Claim 5] An information distribution service system according to claim 1, said information distribution service system characterized in that said computer system executes the steps of:

informing a mobile-communication enterprise of information on a mobile information terminal moving to a position at a place in an area at and/or in said mobile information terminal's moving destination and/or moving direction predicted on the basis of an inference formula defined from information on positions of said mobile information terminal;

finding a moving speed of said mobile information terminal from positional information accumulated in the past;

informing an information-provider terminal inferred to be a terminal located at said mobile information terminal's moving destination of an expected time of arrival of said mobile information terminal at said moving destination where said expected time of arrival is a time predicted by using an inference formula based on a present position of said mobile information terminal;

determining moving means, on which a user of said mobile information terminal is riding, from a combination

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of said mobile information terminal's moving speed and
displacements in positional information; and

informing said mobile-information terminal of
operational information obtained from an enterprise
managing operations of said moving means.


[Detailed Description of the Invention]

[0001]

[Technical Field to which the Invention Pertains]

The present invention relates a technique of
rendering an information distribution service to provide
a user of a mobile information terminal with information
such as area information optimum for a predicted location
of the user in advance.

[0002]

[Prior Art]

A service and/or a function based on information on
positions of the conventional mobile information terminal
allow information on the vicinity of the present position
(the current location) of the mobile information terminal
to be obtained by determining or inputting the present
position. That is to say, the information on the vicinity
of the present position of the mobile information
terminal can be obtained only on condition that the

mobile information terminal is currently located at the present position. In addition, there are also cases in which the mobile information terminal is provided with obsolete information no longer required by the user of the mobile information terminal. An example of such information is information on an area already left by the mobile information terminal. Furthermore, there is no means for distributing information to mobile information terminals moving in a specific direction by adoption of a multi-casting or broadcasting technique.

[0003]

[Problems to be Solved by the Invention]

However, the conventional information distribution service has the following problems. If a user carrying a mobile information terminal does not enter information on a destination of the movement of the user to the terminal, the existence of information on the destination of the movement or information on an area on the way in the direction of the movement is not known. In general, only information on the vicinity of the present position of the mobile information terminal can be obtained and distributed information includes obsolete information not required by the user. In addition, the obsolete information not required by the user is displayed in some

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cases. Furthermore, information on accidents at a
destination of a mobile information terminal moving in a
specific direction and disaster or urgent information
cannot be transmitted to the mobile information terminal
as a notification whereas congestions cannot be
controlled either.

[0004]

It is thus an object of the present invention to
provide a user of a mobile information terminal with
information such as advance area information suitable for
a predicted moving destination (or a predicted moving
direction) of the user and to control a mobile
information terminal located at the same moving
destination (or at a position on the way to the same
moving direction).

[0005]

[Means for Solving the Problems]

In accordance with an aspect of the present
invention, there is provided an information distribution
service system comprising a plurality of mobile
information terminals, a computer system and a plurality
of information-provider terminals wherein said mobile
information terminals, said computer system and said
information-provider terminals are connected to each

other by a communication network, said information distribution service system characterized in that:

said computer system predicts a mobile information terminal's moving destination and moving direction by inferring said mobile-information terminal's positional displacements along the time axis on the basis of information on positions of said mobile information terminal including a pre-registered information category whose information distribution service, distribution and notification are desired, and on the basis of an inference formula provided in advance with said mobile information terminal's moving direction and position; and

said computer system determines an information-provider terminal predicted to exist at said predicted moving destination of said mobile information terminal on the basis of locations of information-provider terminals pre-recording plans to distribute information as a notification, and determines distributed and reported information corresponding to an information category registered in advance by said mobile information terminal among pieces of information to be provided by said selected information-provider terminal.

[0006]

It is desirable to provide an implementation of

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said information distribution service system wherein, if
it is impossible to determine an inference formula for
predicting said mobile information terminal's moving
direction and position from positional displacements of
said mobile information terminal with each geographical
position used as an origin on the basis of map
information, said computer system finds an inference
formula for predicting said mobile information terminal's
most recent moving destination and most recent moving
direction each time most recent information on a position
of said mobile information terminal is obtained.

[0007]

It is also desirable to provide another
implementation of said information distribution service
system wherein, if an inference formula, which is found
as an equation for predicting said mobile information
terminal's moving destination and moving direction each
time most recent information on a position of said mobile
information terminal is obtained, changes very frequently
in a time series, said computer system predicts a
polarity of a movement of said mobile information
terminal by application of a partial derivative and on
the basis of said mobile information terminal's
positional information accumulated in the past.

[0008]

[Mode for Carrying out the Invention]

Before embodiments of the present invention are explained, the principle of the present invention is described. Fig. 1 is a diagram showing the basic configuration of an information distribution service system. The information distribution service system includes a computer system 2, a plurality of information-provider terminals 4#i where i = 1 to n and a plurality of user terminals 6#i where i = 1 to m. The computer system 2 is an application service provider (ASP) connected to the information-provider terminals 4#i and the user terminals 6#i by a network typically comprising gateways (GWs) 8a, the Internet 8b, a mobile-communication network 8c and enterprise networks (NW) 8d. The information-provider terminals 4#i are each a terminal owned by a provider supplying information to users. Examples of the information-provider terminals 4#i are an enterprise terminal connected to the enterprise NW 8d, a personal-business terminal such as SOHO and a mobile terminal. On the other hand, the user terminals 6#i are each a mobile terminal owned by a recipient of the provided information. An example of the user terminal 6#i is a mobile phone.

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[0009]

The computer system 2 has the following functions:

(i): Register the position of an information provider and information provided to users as well as their categories for each of the information-provider terminals 4#i.

(ii): Register the category of user information and the category of desired information to be provided to a user for each of the user terminals 6#i.

(iii): Infer the next position of a moving user from the present and previous positions of the user terminal 6#i by using an inference formula.

(iv): Determine an information provider from an inferred position of the user terminal 6#i.

(v): Distribute information to the user terminals 6#i.

(vi): Analyze users' responses to distributed information.

[0010]

The information-provider terminal 4#i has a function of requesting the computer system 2 to register a position thereof and information provided thereby in the computer system 2. The information-provider terminal 4#i can be a stationary or mobile terminal.

The user terminal 6#i has the following functions:

(i): Request the computer system 2 to register the category of user information and the category of desired

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information to be provided to the user in the computer system 2.

(ii): Inform the computer system 2 that the user terminal 4#i is a GPS-function terminal in case the user terminal 4#i is a GPS-function terminal or that the user terminal 4#i is a non-GPS-function terminal in case the user terminal 4#i is a non-GPS-function terminal.

(iii): Display information received from the computer system 2 and transmits a response to the information to the computer system 2.

[0011]

Fig. 2 is a diagram showing the configuration of the computer system 2. As shown in Fig. 2, the computer system 2 includes a CPU 10, an execution processing unit 12, a communication processing unit 14 and a storage unit 16. The execution processing unit 12 includes a user management unit 20, a position management unit 22, an information management unit 24 and an information-distribution management unit 25. The communication processing unit 14 communicates with the information-provider terminals 4#i and the user terminals 6#i through gateways (GWs) 8a, the Internet 8b, the mobile-communication network 8c and enterprise networks (NW) 8d. The storage unit 16 is used for storing a user-

information database 26, a user-location database 28, an information-provider database 30, an area-information database 32, an inferred-information database 34 and an analysis database 36.

[0012]

Fig. 3 is block diagrams each showing functions of the information-provider terminal 4#i. To be more specific, Fig. 3(a) is a block diagram showing functions of a mobile information-provider terminal while Fig. 3(b) is a block diagram showing functions of a stationary information-provider terminal. The mobile information-provider terminal's configuration elements essentially identical to those of the stationary information-provider terminal are denoted by the same reference numerals as their counterparts in the stationary information-provider terminal. As shown in Fig. 3(a), the mobile information-provider terminal comprises a CPU 50, an execution processing unit 51, a radio-communication processing unit 52, a display unit 54, a storage unit 56 and an input unit 58. The execution processing unit 51 includes an information-registration processing unit 60, an information-display-execution processing unit 62 and the input unit 58. On the other hand, the stationary information-provider terminal comprises a CPU 50, an

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execution processing unit 51, a communication processing unit 70, a display unit 54, a storage unit 56 and an input unit 58 as shown in Fig. 3(b).

[0013]

Fig. 4 is block diagrams each showing functions of the user terminal 6#i. To be more specific, Fig. 4(a) is a block diagram showing functions of a non-GPS user information terminal while Fig. 4(b) is a block diagram showing functions of a GPS user information terminal. The non-GPS user terminal's configuration elements essentially identical to those of the GPS user terminal are denoted by the same reference numerals as their counterparts in the GPS user terminal. As shown in Fig. 4(a), the non-GPS user information terminal comprises a CPU 80, an execution processing unit 82, a radio-communication processing unit 84, a display unit 86, a storage unit 88 and an input unit 96. The execution processing unit 82 includes a terminal-registration processing unit 90, a positional-information-reporting processing unit 92 and an information display execution processing unit 94. On the other hand, the GPS user information terminal comprises a GPS-apparatus unit 100 in addition to the non-GPS user information terminal as shown in Fig. 4(b).

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[0014]

Fig. 5 is a block diagram showing functions relevant to user management and position management. A user management unit 20 comprises a user-interface processing unit 150, a user-service-reception processing unit 152, a registration-service analysis processing unit 154 and a registration-menu output processing unit 156. Fig. 6 is a block diagram showing functions relevant to information management. Figs. 7 to 9 are each a block diagram showing functions relevant to position management control. Fig. 10 is a block diagram showing functions relevant to information distribution management.

[0015]

The position management unit 22 comprises the user-interface processing unit 150, a user-positional information reception processing unit 160 and the user-positional information history management processing unit 162, which are shown in Fig. 5, an inference-formula generation processing unit 230 shown in Fig. 7, a user-present-positional information determination processing unit 260, an inference-formula-candidate extraction determination processing unit 262, a user-displacement-position history processing unit 264, an inference-formula determination processing unit 266, an

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information-provider-location determination processing unit 270, an information-provider-candidate extraction determination processing unit 272 and an information-provider determination processing unit 274, which are shown in Fig. 8, a user-displacement adequacy check processing unit 300, a distribution-order determination processing unit 302, an Information-distribution processing management unit 304 and an Information-distribution execution processing unit 306, which are shown in Fig. 9.

[0016]

The information management unit 24 includes an information-provider interface processing unit 200, an information-provider registration reception processing unit 202, a registration menu output processing unit 204 and a registration-information analysis processing unit 206, which are shown in Fig. 6. The information-provider management unit 25 comprises a user-interface processing unit 150, a distributed-information user-response reception processing unit 350, a user analysis processing unit 352, an information-provider analysis processing unit 354, a response-attribute analysis processing unit 356, an analysis-result edit processing unit 358, an analysis-result communication processing unit 360, the

information-provider interface processing unit 200 and an analysis-result-report-writing processing unit 362, which are shown in Fig. 10.

[0017]

The user-information database 26 is a database for storing information on users. The user-information database 26 has a user master database 170 and a user registration service category master database 172, which are shown in Fig. 5. The user-location database 28 is a database for storing information on locations of users. The user-location database 28 comprises a user-location master database 180 and a user-location information history database 182. The information-provider database 30 is a database for storing information on information providers. The information-provider database 30 includes an information-provider master database 210 and a registration-information category master database 212, which are shown in Fig. 6.

[0018]

The area-information database 32 is a database for storing information on areas such as traffic information in areas, information on trunks and train schedules. The inferred-information database 34 is a database for storing information required for inferring the position

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of a user. The inferred-information database 34 has a map-information master database 232 and an inference-formula master database 234, which are shown in Fig. 7, a user present location database 280, a user location displacement database 284, a candidate inference-formula database 286, a determined-inference-formula database 288, an information-provider location database 290, a candidate information-provider database 292 and an information-provider database 294, which are shown in Fig. 8, and a target-user database 310, a distribution target information-provider database 312 and a distribution log database 314, which are shown in Fig. 9. The analysis database 36 is a database for storing data required in analyses of responses of users to the information given by the information provider. The analysis database 36 comprises a user response result master database 378, a user analysis log database 380, an information-provider analysis log database 382, a response-attribute analysis log database 384 and an analysis result database 386, which are shown in Fig. 10.

[0019]

Fig. 11 shows a flowchart representing processing carried out by the computer system 2. Fig. 12 shows a flowchart representing user management processing. Fig.

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13 shows a flowchart representing information management processing. Fig. 14 shows a flowchart representing position management processing. Fig. 15 shows a flowchart representing information-provider management processing. Fig. 16 shows a flowchart representing processing carried out by a user terminal. Fig. 17 shows a flowchart representing processing to register a user terminal. Fig. 18 shows a flowchart representing processing to report positional information. Fig. 19 shows a flowchart representing information-display execution processing. Fig. 20 shows a flowchart representing processing carried out by the information-provider terminal. Fig. 21 shows a flowchart representing a process to register information. Fig. 22 shows a flowchart representing processing to change an information display. Fig. 23 shows a flowchart representing processing to delete information.

[0020]

Fig. 24 is a diagram showing structures of data transmitted by the computer system to a user terminal. Fig. 25 is a diagram showing structures of data transmitted to the computer system by a user terminal. Fig. 26 is a diagram showing structures of data transmitted by the computer system to an information-provider terminal. Fig. 27 is a diagram showing

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structures of data transmitted to the computer system by an information-provider terminal.

[0021]

Fig. 28 is a diagram showing a basic sequence shown in processing to register user information. Fig. 29 is a diagram showing a basic sequence shown in processing to register provided information. Fig. 30 is a diagram showing a basic sequence shown in processing to modify a display of provided information. Fig. 31 is a diagram showing a basic sequence shown in processing to delete provided information. Fig. 32 is a diagram showing a basic sequence shown in an information-providing service for a user terminal functioning as a GPS terminal. Fig. 33 is a diagram showing a basic sequence shown in an information-providing service for a user terminal functioning as a non-GPS terminal.

[0022]

Fig. 34 is a diagram showing a user-registration screen of a user terminal. Fig. 35 is a diagram showing a user-registration completion screen of a user terminal. Fig. 36 is a diagram showing a selection menu screen for an information provider. Fig. 37 is a diagram showing an information-registration screen for an information provider. Fig. 38 is a diagram showing an information

menu screen of a user terminal. Fig. 39 is a diagram showing an information-registration screen for an information provider. Fig. 40 is a diagram showing a user-registration completion screen for an information provider. Fig. 41 is a diagram showing an information-display-changing screen (category selection) for an information provider. Fig. 42 is a diagram showing an information-display-changing screen (displaying detailed information) for an information provider. Fig. 43 is a diagram showing an information-changing completion screen for an information provider. Fig. 44 is a diagram showing an information-deletion screen (category selection) for an information provider. Figs. 45 and 46 are each a diagram showing an information-deletion screen (displaying detailed information deletion) for an information provider. Fig. 47 is a diagram showing an information-deletion completion screen for an information provider. Figs. 48 to 50 are each a diagram showing an inference mechanism.

[0023]

(1): Registration of User Information

At a step S200 of the flowchart shown in Fig. 16, the terminal-registration processing unit 90 carries out a process to register a user terminal as follows. The

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user makes a request for a user-registration menu by entering a special number or the like via a keyboard. At a step S250 of the flowchart shown in Fig. 17, the terminal-registration processing unit 90 forms a judgment as to whether or not a request for a user-registration menu has been received. If a request for a user-registration menu has been received, the flow of the processing goes on to a step S252. If a request for a user-registration menu has not been received, on the other hand, the flow of the processing goes on to a step S254. Since the user has made a request for a user-registration menu, in this case, the flow of the processing goes on to the step S252. At the step S252, the request for a user-registration menu is transmitted to the computer system 2 as indicated by an arrow (2) of the basis sequence shown in Fig. 28. As shown in Fig. 25(a), the request for a user-registration menu includes a request identification number and the IP address of the user terminal 6#i or the phone number of the user terminal 6#i.

[0024]

At a step S2 of the flowchart shown in Fig. 11, the user management unit 20 carries out the following processing. The request for a user-registration menu is

transmitted to the user service reception processing unit

152 by way of the user-interface processing unit 150

shown in Fig. 5. At a step S20 of the flowchart shown in

Fig. 12, the user-interface processing unit 150 forms a

judgment as to whether or not the request for a user-

registration menu has been received. If the request for a

user-registration menu has been received, the flow of the

processing goes on to a step S22. If the request for a

user-registration menu has not been received, on the

other hand, the flow of the processing goes on to a step

S24.

[0025]

Since the request for a user-registration menu has

been received, in this case, the flow of the processing

goes on to the step S22. At the step S22, the

registration-menu output processing unit 156 shown in Fig.

5 transmits a user-registration menu to the user terminal

6#i by way of the user-interface processing unit 150 as

indicated by an arrow (6) of the basic sequence shown in

Fig. 28. As indicated by an arrow (8) of the basic

sequence shown in Fig. 28, the user-registration menu is

transmitted to the user terminal 6#i by way of a mobile-

communication enterprise. As shown in Fig. 24(a), a

packet of the user-registration menu includes an

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identification number, the IP address of the user

terminal 6#i or the phone number of the user terminal 6#i

and the user-registration menu itself.  The IP address or

the telephone number is included in a packet used for

making a request for the user-registration menu.

[0026]

At a step S254 of the flowchart shown in Fig. 17,

the terminal-registration processing unit 90 forms a

judgment as to whether or not a user-registration menu

has been received.  If a user-registration menu has been

received, the flow of the processing goes on to a step

S256.  If a user-registration menu has not been received,

on the other hand, the flow of the processing goes on to

a step S258.  At the step S256, the terminal-registration

processing unit 90 displays the user-registration menu on

the display unit 86.  As shown in Fig. 34, the user-

registration menu displays information on the user,

categories of information to be provided to the user as

desired by the user and a menu operation portion.  The

information on the user includes a user name and a

password.  The categories of information to be provided to

the user as desired by the user include information on

traffic, information on shopping, information on events

and information on restaurants.  The menu operation

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portion includes REGISTER, CANCEL, URGENT, LIST and HELP
buttons. The URGENT button is operated to indicate that
the desired information is needed now. The LIST button is
operated to display detailed information for checking
registered information. The HELP button is operated to
display guidance information.

[0027]

The user enters user-registration information
including a user name, a password and an information
category in accordance with a user-registration menu
appearing on the display unit 86 and then presses the
REGISTER button. At the step S258 of the flowchart shown
in Fig. 17, a judgment is formed to determine whether or
not the user-registration information has been entered.
If the user-registration information has been entered,
the flow of the processing goes on to a step S259. If the
user-registration information has not been entered, on
the other hand, the flow of the processing goes on to a
step S260. Since the user-registration information has
been entered, in this case, the flow of the processing
goes on to the step S259. At the step S259, a user-
information input packet shown in Fig. 25(b) is
transmitted to the computer system 2 as indicated by an
arrow (10) of the basic sequence shown in Fig. 28. The

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user-information input packet typically includes a
request identification number, the IP address of the user
terminal 6#i or the phone number of the user terminal 6#i,
the password, the user name and the information category.
As indicated by an arrow (12) of the basic sequence shown
in Fig. 28, the user-information input packet is
transmitted to the computer system 2 by way of the
mobile-communication enterprise.

[0028]

At the step S24 of the flowchart shown in Fig. 12,
a judgment is formed to determine whether or not the
user-registration information has been received.  If the
user-registration information has been received, the flow
of the processing goes on to a step S26.  If the user-
registration information has not been received, on the
other hand, the processing is ended.  Since the user-
registration information has been received, in this case,
the flow of the processing goes on to the step S26.  At
the step S26, the registration-service analysis
processing unit 154 shown in Fig. 5 forms a judgment as
to whether or not the user is a new user.  If the user is
a new user, the flow of the processing goes on to a step
S28.  If the user is not a new user, on the other hand,
the flow of the processing goes on to a step S30.  The

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judgment as to whether or not the user is a new user is formed by finding out whether or not the same user name has been registered in the user master database 170 of the user-information database 26.

[0029]

At the step S28 of the flowchart shown in Fig. 12, the user name, the password and the IP address or the phone number are registered in the user master database 170. The user name and the information category are registered in the user registration service category master database 172 for the category. At the step S30, the password included in the user-registration information is compared with a password already registered in the user-information database 26 to determine whether or not the password included in the user-registration information is valid. If the password included in the user-registration information is found valid, the flow of the processing goes on to a step S31 at which the modified user-registration information is registered in the user-information database 26. Then, the flow of the processing goes on to a step S32. If the password included in the user-registration information is found invalid, on the other hand, the flow of the processing goes on to a step S34.

[0030]

At the step S32, a packet containing a user-information-inputting operation completion notification including an identification number, an IP address or a phone number and completion information as shown in Fig. 24(b) is transmitted to the user terminal 6#i as indicated by an arrow (14) of the basic sequence shown in Fig. 28. The notification of user-information-inputting operation completion is transmitted as indicated by an arrow (16) of the basic sequence shown in Fig. 28 to the user terminal 6#i by way of the mobile-communication enterprise. In the case of an invalid password, however, the user is requested to reenter a password at the step S34 of the flowchart shown in Fig. 12. At a step S260 of the flowchart shown in Fig. 17, a judgment is formed to determine whether or not a notification of user-information-inputting operation completion has been received. If a notification of user-information-inputting operation completion has been received, the flow of the processing goes on to a step S262. If a notification of user-information-inputting operation completion has not been received, on the other hand, the processing is finished. At the step S262, a user-registration result like the one show in Fig. 35 is displayed on the display

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unit 86.

[0031]

(2): Information Registration

At a step S400 of the flowchart shown in Fig. 20, the information-registration processing unit 60 employed in the information-provider terminal 4#i carries out processing to register information as follows. The following description explains the processing to register information for a case in which the information-provider terminal is a mobile terminal. A selection menu shown in Fig. 36 is transmitted by the computer system 2 and displayed on a screen by the information-registration processing unit 60. The user is allowed to select one of operations to register, display, change and delete information. Assume that the user selects the operation to register information. At a step S420 of the flowchart shown in Fig. 21, the information-registration processing unit 60 forms a judgment as to whether or not a request for an information-registration menu has been made. If a request for an information-registration menu has been made, the flow of the processing goes on to a step S422. If a request for an information-registration menu has not been made, on the other hand, the flow of the processing goes on to a step S424. Since a request for an

information-registration menu has been made, in this case,
the flow of the processing goes on to the step S422. At
the step S422, the request for an information-
registration menu shown in Fig. 27(a) is transmitted to
the computer system 2 as indicated by an arrow (50) of
the basic sequence shown in Fig. 29.

[0032]

At a step S4 of the flowchart shown in Fig. 11, the
information management unit 24 carries out the following
processing. At a step S150 of the flowchart shown in Fig.
13, a judgment is formed to determine whether or not a
request for an information-registration menu has been
made. If a request for an information-registration menu
has been made, the flow of the processing goes on to a
step S152. If a request for an information-registration
menu has not been made, on the other hand, the flow of
the processing goes on to a step S154. At the step S152,
a packet of the information-registration menu is
transmitted to the information-provider terminal 4#i by
way of the mobile-communication enterprise as indicated
by an arrow (52) of the basic sequence shown in Fig. 29.
As shown in Fig. 26(a), the packet of the information-
registration menu includes an identification number, an
IP address of or a phone number and the information-

registration menu itself.

[0033]

At a step S424 of the flowchart shown in Fig. 21, a judgment is formed to determine whether or not an information-registration menu has been received. If an information-registration menu has been received, the flow of the processing goes on to a step S426. If an information-registration menu has not been received, on the other hand, the flow of the processing goes on to a step S428. At the step S426, the information-registration menu shown in Fig. 37 is displayed on the display unit 54. The screen of the information-registration menu is identical to the screen of the user-registration menu. If information on shopping is entered as a category of information provided by the information provider, for example, an information menu shown in Fig. 38 is displayed. If category information in the information menu is entered, a detailed-information input screen shown in Fig. 39 is displayed.

[0034]

The information provider enters detailed information like one shown in Fig. 39. As the operation to enter the detailed information is completed, the information provider clicks a REGISTER button. At a step

S428 of the flowchart shown in Fig. 12, a judgment is formed to determine whether or not information to be provided has been entered. If information to be provided has been entered, the flow of the processing goes on to a step S430. If information to be provided has not been entered, on the other hand, the flow of the processing goes on to a step S432. At the step S430, the information-registration processing unit 60 transmits inform to be provided to the computer system 2 as indicated by an arrow (54) of the basic sequence shown in Fig. 29. As shown in Fig. 27(b), the information to be provided includes a password, category information and detailed information.

[0035]

The provided information is transferred to the information-provider registration reception processing unit 202 by way of the information-provider interface processing unit 200 shown in Fig. 6. At a step S154 of the flowchart shown in Fig. 13, the information-provider registration reception processing unit 202 forms a judgment as to whether or not the provided information has been received. If the provided information has been received, the flow of the processing goes on to a step S156. If the provided information has not been received,

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on the other hand, the processing is ended. At the step

S156, the registration-information analysis processing

unit 206 shown in Fig. 6 checks the provided information,

registers the information on the information provider in

the information-provider master database 210 as indicated

by an arrow (55) of the basic sequence shown in Fig. 29

and registers the provided information of the information

provider in the registration-information category master

database 212 for the category of the provided information.

At a step S158 of the flowchart shown in Fig. 13, a

provided-information-inputting completion notification

shown in Fig. 26(b) is reported to the information-

provider terminal 4#i by way of the mobile-communication

enterprise as indicated by an arrow (56) of the basic

sequence shown in Fig. 29.

[0036]

At a step S432 of the flowchart shown in Fig. 21, a

judgment is formed to determine whether or not the

provided-information-inputting completion notification

has been received. If the provided-information-inputting

completion notification has been received, the flow of

the processing goes on to a step S434. If the provided-

information-inputting completion notification has not

been received, on the other hand, the processing is ended.

At the step S434, an information-registration result shown in Fig. 40 is displayed. If the information provider is a stationary terminal, operations indicated by arrows (70) to (76) are carried out. It is to be noted that, if the information-provider terminal 4#i is a mobile terminal, information on the position of the information-provider terminal 4#i is transmitted to the computer system 2 by execution of the same procedure as a procedure of transmitting information on the position of a user terminal 6#i. The procedure of transmitting information on the position of a user terminal 6#i to the computer system 2 will be described later. The position management unit 22 updates the information on the position of the information-provider terminal 4#i with the most recent information received as such. The information on the position of the information-provider terminal 4#i is stored in the information-provider master database 210.

[0037]

(3): Modification of Information Display

The information provider is capable of changing provided information. At a step S402 of the flowchart shown in Fig. 20, a process to change an information display is carried out. Detailed operations of the

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process to change an information display are carried out at steps S450 to S464 of the flowchart shown in Fig. 22. If the information provider is a mobile terminal, the following processing is carried out. As indicated by an arrow (80) of the basic sequence shown in Fig. 30, the information-provider terminal 4#i transmits an information-display-changing menu request shown in Fig. 27(f) to the computer system 2. As indicated by an arrow (82), the computer system 2 transmits an information-display-changing menu shown in Fig. 26(f) to the information-provider terminal 4#i. The information-provider terminal 4#i displays an information-display-changing menu screen shown in Fig. 41. The information provider changes details of the provided information as shown in Fig. 42. As indicated by an arrow (84) of the basic sequence shown in Fig. 30, the information-provider terminal 4#i transmits a provided-information-change request shown in Fig. 27(d) to the computer system 2. As indicated by an arrow (86), the computer system 2 transmits a provided-information-completion notification shown in Fig. 26(d) to the information-provider terminal 4#i. The information-provider terminal 4#i displays a provided-information-change completion notification screen shown in Fig. 43. As indicated by an arrow (87),

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the computer system 2 updates the provided information

stored in the information-provider master database 210

with the changes in provided information.

If the information provider is a stationary

terminal, on the other hand, operations indicated by

arrows (90) to (95) are carried out.

[0038]

(4): Deletion of Information

The information provider is capable of deleting

provided information. At a step S404 of the flowchart

shown in Fig. 20, a process to delete provided

information is carried out. Detailed operations of the

process to delete provided information are carried out at

steps S480 to S494 of the flowchart shown in Fig. 23. The

process to delete provided information is similar to the

process to change provided information. If the

information provider is a mobile terminal, operations

indicated by arrows (100) to (106) of the basic sequence

shown in Fig. 31 are carried out. If the information

provider is a stationary terminal, on the other hand,

operations indicated by arrows (110) to (116) are carried

out. In the case of the process to delete provided

information, an information deletion screen shown in Fig.

44, detailed-information-deletion screens shown in Figs.

36

45 to 46 and an information deletion completion screen shown in Fig. 47 are displayed.

[0039]

(5): Position Inference

(a): Position Inference for a GPS Terminal

When the user operates the user terminal 6#i to specify a SERVICE button appearing on the screen shown in Fig. 34, as indicated by an arrow (150) of the basic sequence shown in Fig. 32, the user terminal 6#i transmits a service-start request shown in Fig. 25(f) to the computer system 2. The user terminal 6#i carries out a process to register a position at a step S202 of the flowchart shown in Fig. 16 as follows. At a step S300 of the flowchart shown in Fig. 18, a judgment is formed to determine whether or not a GPS function is embedded. If a GPS function is embedded, the flow of the processing goes on to a step S302. If a GPS function is not embedded, on the other hand, the flow of the processing goes on to a step S306.

[0040]

At the step S302, the GPS-apparatus unit 100 shown in Fig. 4 measures its own position. Then, at the next step S304, a positional information notification message shown in Fig. 25(c) is transmitted to the computer system

2 as indicated by an arrow (152) of the basic sequence shown in Fig. 32. The positional information notification message includes a request identification number, an IP address or a phone number, positional information comprising a latitude and a longitude and time information. The positional information is supplied to the user-positional information reception processing unit 160 by way of the user-interface processing unit 150 shown in Fig. 5. At a step S52 of the flowchart shown in Fig. 14, the user-positional information reception processing unit 160 stores the positional information in the user-location master database 180. The user-positional information history management processing unit 162 reads out the positional information from the user-location master database 180 and stores the information in the user-location information history database 182.

[0041]

(b): Position Inference for Non-GPS Terminal

Much like a GPS terminal, a non-GPS terminal makes a request for a start of a service as indicated by an arrow (200) of the basic sequence shown in Fig. 33. In the case of a non-GPS terminal, however, positional information is reported to the computer system 2 by requesting the mobile-communication enterprise to inform

the computer system 2 of the positional information at a step S306 of the flowchart shown in Fig. 18. As shown in Fig. 25(e), the positional information includes a request identification number and an IP address or a phone number. The terminal's latitude and longitude included in the positional information are passed on by the mobile-communication enterprise to the computer system 2.

[0042]

At a step S54 of the flowchart shown in Fig. 14, a moving direction and a movement time are computed by inference as follows. The inference-formula generation processing unit 230 shown in Fig. 7 generates an inference formula from map information stored in the map-information master database 232 and stores the inference formula into the inference-formula master database 234. In the generation of the inference formula, the latitudes and the longitudes of a start point and an end point are quantized. The start point is regarded as an origin in a 2-dimensional space. Assume for example that the present position is in the vicinity of a station closest to a bustling street. An inference formula predicting the user's movement from the present position serving as the start point of the movement is a formula stored in the inference-formula master database 234. If there are a

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plurality of candidates for the direction of the movement, a plurality of inference formulas should also have been stored in the inference-formula master database 234 as well. In addition, an inference formula is created in accordance with a plurality of pieces of map information with different scales for each start point.

[0043]

The inference formula is typically an equation expressing a relation between y and x with the start point taken as the origin (0, 0) where x and y are the coordinates of a measured position (x, y). In this case, the x axis is the axis extending from the origin (0, 0) in the East direction whereas the y axis is the axis extending from the origin (0, 0) in the North direction. An x coordinate of a position (x, y) is a distance from the origin (0, 0) to the position (x, y) along the x axis whereas a y coordinate of a position (x, y) is a distance from the origin (0, 0) to the position (x, y) along the y axis. In addition, the map information in use has a variety of scales ranging from a fine scale to a coarse one.

[0044]

Assume for example that map information having a fine scale is used. In this case, an inference formula is

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provided for each branch point such as a point of intersection. If map information having a coarse scale is used, on the other hand, an inference formula is provided only for each big branch point such as a branch point on a trunk road as an inference formula expressing a rough direction. Map information having a relatively coarse scale is used for a high-speed movement of a car or a train. On the other hand, map information having a relatively fine scale is used for a low-speed movement such as a walk of a strolling user carrying a mobile terminal. In this way, the position of a mobile terminal can be inferred with a high degree of accuracy.

[0045]

The user-present-positional information determination processing unit 260 shown in Fig. 8 determines the next location of a user from the user-location information history database 182 and stores information on the location in the user present location database 280. The inference-formula-candidate extraction determination processing unit 262 extracts an inference formula or a plurality of inference formulas from the inference-formula master database 282 and stores the extracted inference formulas in the candidate inference-formula database 286. The extracted inference formulas

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are each a candidate inferred to be a candidate that will

be probably used on the basis of information stored in

the user present location database 280. A candidate

inference formula is typically a formula, the origin of

which coincides with the present location of the user, or

a formula expressing points including one coinciding with

the present location of the user. It is to be noted that,

if a candidate inference formula is not found, an

inference formula is derived from an inference algorithm

to be described later.

[0046]

The user-displacement-position history processing

unit 264 shown in Fig. 8 computes a positional

displacement from the user's immediately preceding

location to a next location on the basis of the user

present location database 280 and stores the displacement

in the user location displacement database 284. The

inference-formula determination processing unit 266 finds

information such as the polarity of a continuous

positional displacement representing changes in user

positional information from the positional displacements

stored in the user location displacement database 284.

The inference-formula determination processing unit 266

then forms a judgment on validity of the candidate

inference formula, determines a valid candidate inference
formula and stores the determined candidate inference
formula in the determined-inference-formula database 288.
It is to be noted that, in order to determine an
inference formula, at least 2 changes in positional
information are required.

[0047]

In an inference mechanism shown in the diagram of
Fig. 48, the horizontal axis represents the lapse of time
(T) and the horizontal axis represents allowed values (B).
Allowed values represent a range of allowed discrepancies
relative to values given by an inference formula. That is
to say, a pair of allowed values defines inference's
allowable upper limit and allowable lower limit. The
allowable upper limit is the upper limit of the range of
allowed discrepancies and the allowable lower limit is
the lower limit of the range of allowed discrepancies. If
the displacement is between allowable upper limit and
allowable lower limit of the inference formula, the
movement of the user is inferred as a movement in a
direction conforming to the inference formula.

[0048]

To put it concretely, a judgment on the validity of
a candidate inference formula is formed as follows.

Assume for example that y = ax is a candidate inference formula, the allowable upper limit is expressed by y = ax + b where b > 0 and the allowable lower limit is expressed by y = ax-b where b > 0. That is to say, + b is the value of the allowable upper limit and -b is the value of the allowable lower limit. In this case, if a difference between the y-coordinate value given by the candidate inference formula and the y-coordinate value of the user at a time T is within the range of allowable values, the movement of the user can be inferred as a movement in a direction conforming to the inference formula. Since the inference formula is a quadratic function expressing a relation between the position of a mobile information terminal and the time, the movement speed of the user can also be found with ease.

[0049]

Assume for example that the user is at positions A0, A1 and A2 at times t0, t1 and t2 respectively. In this case, since the displacements are between allowable upper limit and allowable lower limit of the inference when the user moves from A0 → A1 → A2, the movement of the user can be inferred as a movement in a direction conforming to the inference formula. As another example, assume that the user is at positions B0, B1, B2 and B3 at times t0,

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t1, t2 and t3 respectively. In this case, since the displacements are beyond allowable range between the upper limit and the lower limit of the inference when the user moves along a route of B0 → B1 → B2 → B3, the movement of the user cannot be judged to be a movement in a direction conforming to the inference formula. It is to be noted that the user can be inferred to be in a stationary state between in a period between times t2 and t3 since there is no displacement between the positions B2 and B3.

[0050]

The above description explains an inference mechanism for a case in which a proper inference formula is not stored in the inference-formula master database 234. In order to apply inference appropriate for a loop road or a curved road, a larger number of inference formulas is required. In the inference mechanism shown in Fig. 48, the inference formula is assumed to be a linear equation. In general, however, an ordinary road or an ordinary route is a curved road or a curved route respectively, and has a plurality of points of intersection in some cases. In such a case, it is difficult to find an inference formula in advance. In order to solve this problem, an inference formula is set

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from locations of the user by using a general inference mechanism shown in Fig. 49. For each of positions Pi located at equal time intervals, positional information is reported and recorded.

[0051]

(i): An inference formula $y = a_1x + b_1$ is defined on the basis of positions P0, P1 and P2 at times t0, t1 and t2 respectively. In accordance with a concept taken as a basis for finding the coefficients $a_1$ and $b_1$ of the inference formula $y = a_1x + b_1$, the point P0 (0, 0) is taken as a start point and the inference formula is regarded as an equation representing a linear line passing through the point P0 (0, 0) as well as the middle point $((x_1 + x_2)/2, (y_1 + y_2)/2))$ between the points P1 and P2.

[0052]

(ii): Next, a next inference formula $y = a_2x + b_2$ is defined on the basis of positions P1, P2 and P3 at times t1, t2 and t3 respectively in the same way by taking the point P1 as a start point this time. That is to say, by the same token, the coefficients $a_2$ and $b_2$ of the inference formula $y = a_2x + b_2$ are found by regarding the inference formula as an equation representing a linear line passing through the point P1 as well as the middle

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point between the points P2 and P3.

[0053]

(iii): Subsequently, while shifting the third point Pi, a subsequent inference formula $y = a_i x + b_i$ is defined on the basis of positions $P_{i+1}$, $P_i$ and $P_{i-1}$ where $P_{i+1}$ is the most recent position, $P_i$ is a position preceding the most recent position $P_{i+1}$ and $P_{i-1}$ is a position preceding the point $P_i$.

[0054]

By defining inference formulas on the basis of information on points being shifted, that is, information obtained from a mobile information terminal as described above, it is possible to predict a positional displacement of the mobile information terminal moving through any points on a road or a route.

[0055]

The inference mechanism shown in Fig. 50 is a mechanism for defining an inference formula by application of a partial derivative. As an example, the figure shows a case in which a road has a grid-like shape. As shown in Fig. 50, inference formulas $y = a_1 x + b_1$, $y = a_2 x + b_2$, $y = a_3 x + b_3$ and $y = a_4 x + b_4$ are defined in the same way as the inference mechanism shown in Fig. 49.

[0056]

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(i): An inference formula $y = a_n x + b_n$ is defined from $P_{n-1}$, $P_n$ and $P_{n+1}$ where $P_{n+1}$ is the most recent position.

[0057]

(ii): If there is a drastic variation in an value where an is the gradient of the defined inference formula, that is, if the gradient of an inference formula defined at a point of time is negative ($a_n < 0$) while the gradient of an inference formula defined at the following point of time is positive ($a_{n+1} > 0$), for example, it is possible to conceive a model wherein the mobile information terminal is moving from position to position along a grid-like road like one shown in Fig. 34. In such a case, by defining an inference formula for each positional displacement and, at the same time, by defining the found inference formula by application of a partial derivative and on the basis of all positional information stored in the past, it is possible to show the polarity (or the trend) of the positional displacements of the mobile information terminal. In the case of the inference mechanism shown in Fig. 50, the inference formula $y = a_i x + b_i$ shows the polarity (or the trend) of the positional displacements of the mobile information terminal. It is thus possible to show the polarity (or the trend) of the positional displacements by defining an inference formula

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for each positional displacement and, at the same time, by defining the inference formula through application of a partial derivative and on the basis of all past positional displacements. By using such means, it is possible to infer that a movement is a movement along a curved road or a grid-like road.

[0058]

The user-displacement adequacy check processing unit 300 shown in Fig. 9 forms a judgment as to whether or not the user's positional displacement stored in the user location displacement database 284 is a displacement based on an inference formula stored in the determined-inference-formula database 288. If the positional displacement is not based on an inference formula, the inference-formula-candidate extraction determination processing unit 262 employed in an inference-formula determination processing management unit 250 shown in Fig. 8 is requested to extract a new inference formula for the user. As requested, the inference-formula-candidate extraction determination processing unit 262 extracts a new inference formula and stores the formula in the candidate inference-formula database 286.

[0059]

Assume for example that inference formulas A and B

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have been determined. Inference formula A takes a relatively coarse map with a large scale factor as a reference whereas inference formula B takes a relatively fine map with a small scale factor as a reference. In this case, if the user carrying the mobile information terminal is moving at a high speed, it is generally assumed that there is a case in which the positional displacement of the user comes off inference formula B used for predicting a positional displacement of the user.

[0060]

If the user carrying the mobile information terminal is moving at a low speed, on the other hand, an inference formula taking a fine map with a small scale factor as a reference is determined to be an inference formula for predicting a positional displacement of the user. The inference-formula determination processing unit 266 shown in Fig. 8 selects an inference formula among candidates for the inference formula, which are read out from the user location displacement database 284, and stores the selected inference formula in the determined-inference-formula database 288. The validity of this new inference formula is again checked by the user-displacement adequacy check processing unit 300. As described above, the direction of the movement of the

user and the movement time are inferred.

[0061]

(6): Determination of Information on an Information Provider

At a step S56 of the flowchart shown in Fig. 14, the area-information database 32 (the map-information master database 232) and the information-provider database 30 (the information-provider master database 210 and the registration-information category master database 212) are searched for information corresponding to the moving direction and the movement time. The information-provider-location determination processing unit 270 shown in Fig. 8 finds locations of the information provider from the map-information master database 232 and the information-provider master database 210, and stores information on the locations of the information provider in the information-provider location database 290.

[0062]

The information-provider-candidate extraction determination processing unit 272 extracts information providers on the basis of the user's present position stored in the user present location database 280 and on the basis of an information category desired by the user, locations of information providers and categories of

information provided by the information providers, and

stores the extracted information providers in the

candidate information-provider database 292. The

information-provider determination processing unit 274

shown in Fig. 8 determines an information provider in an

area surrounding the mobile information terminal's

position predicted by an inference formula stored in the

determined-inference-formula database 288 among those

stored in the candidate information-provider database 292

and stores the determined information provider in the

information-provider database 294. A method for

determining such an information provider comprises the

steps of:

(i): Regarding the inference formula as an equation

representing a regression straight line.

(ii): Finding distances (residuals) to the location of

each information provider existing in the vicinity of the

mobile information terminal's moving destination

predicted to be in an allowable range determined for the

inference formula by adoption of the least-square method.

(iii): Determining that an information provider is

located at the mobile information terminal's moving

destination predicted by the reference formula if the

residual found by adoption of the least-square method for

the information provider is in a range determined for the inference formula.

[0063]

The distribution-order determination processing unit 302 shown in Fig. 9 determines a distribution priority order of selected information providers and stores the distribution priority order in the distribution information-provider database 312. The distribution priority order is determined on the basis of typically contracts made with the information providers.

[0064]

(7): Information Display Execution Processing

At a step S58 of the flowchart shown in Fig. 14, the Information-distribution execution processing unit 306 employed in the user management unit 20 and shown in Fig. 9 edits an information menu on the basis of an information category read out from the user-information database 26 (the user registration service category master database 172). Then, at the next step S60, an information menu shown in Fig. 24(c) is transmitted as indicated by an arrow (154) of the basic sequence shown in Fig. 32 and an arrow (204) shown in Fig. 33. At a step S320 of the flowchart shown in Fig. 19, the information display execution processing unit 92 shown in Fig. 4

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forms a judgment as to whether or not the information

menu has been received. If the information menu has been

received, the flow of the processing goes on to a step

S322. If the information menu has not been received, on

the other hand, the flow of the processing goes on to a

step S328. At the step S322, the information menu is

displayed. The information menu typically includes

categories registration by the user. Examples of the

categories are information on traffic, information on

trains and buses, information on shopping, information on

events and information on concerts. Then, at the next

step S324, a judgment is formed to determine whether or

not selected information has been received. If the

selected information has been received, the flow of the

processing goes on to a step S326. If the selected

information has not been received, on the other hand, the

flow of the processing goes on to a step S328. At the

step S326, the selected information shown in Fig. 25(d)

is transmitted to the computer system 2 as indicated by

an arrow (156) of the basic sequence shown in Fig. 32 and

an arrow (206) of the basic sequence shown in Fig. 33.

[0065]

At a step S100 of the flowchart shown in Fig. 15,

the user service reception processing unit 152 shown in

54

Fig. 5 forms a judgment as to whether or not the selected

information has been received from the user-interface

processing unit 150. If the selected information has been

received, the flow of the processing goes on to a step

S102. If the selected information has not been received,

on the other hand, the processing is ended. At the step

S102, detailed information corresponding to the selected

information is extracted from the distribution

information-provider database 312 on the basis of the

user's inferred position stored in the target-user

database 310.

[0066]

To be more specific, if the selected information is

information on traffic, the detailed information is

information on traffic jams for a direction in which the

user is moving forward. If the selected information is

information on trains and buses, the detailed information

includes information on arrival times of a vehicle, on

which the user is riding, and information on places for

changing trains or buses on which the user is riding. If

the selected information is information on resort, the

detailed information includes information on parking lots,

information on seaside house and information on

restaurants in a specific area on the way for a direction

in which the user is moving forward. At a step S104 of the flowchart shown in Fig. 15, the detailed information shown in Fig. 24(d) is transmitted to the user terminal 6#i by way of the Information-distribution execution processing unit 306 and the user-interface processing unit 150, which are shown in Fig. 9, as indicated by an arrow (158) of the basic sequence shown in Fig. 32 and an arrow (208) of the basic sequence shown in Fig. 33. Then, at the next step S106 of the flowchart shown in Fig. 15, the selected category information, the distribution time and the number of users to which the detailed information is distributed are recorded in the distribution log database 314.

[0067]

At a step S328 of the flowchart shown in Fig. 19, a judgment is formed to determine whether or not the detailed information has been received. If the detailed information has been received, the flow of the processing goes on to a step S330. If the detailed information has not been received, on the other hand, the processing is ended. At the step S330, the detailed information is displayed. To be more specific, if the selected information is information on traffic, what is displayed as the detailed information is information on traffic

jams for a direction in which the user is moving forward.
If the selected information is information on trains and
buses, what are displayed as the detailed information
include information on arrival times of a vehicle, on
which the user is riding, and information on places for
changing a train or a bus on which the user is riding.  If
the selected information is information on resort, what
are displayed as the detailed information include
information on parking lots, information on seaside house
and information on restaurants in a specific area on the
way for a direction in which the user is moving forward.
As an alternative, what are displayed as the detailed
information include information on buying at a bargain at
a department store or the like existing on the way for a
direction in which the user is moving forward,
information on seasonal bargains at such a department
store and information on bargain coupons issued by such a
department store.

[0068]

        If the user further selects a specific item among
items of the detailed information, the selected item is
transmitted from the user terminal 6#i to the computer
system 2 and received by the computer system 2.  Assume
for example that a coupon item is selected from the

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detailed information. In this case, detailed information

corresponding to the coupon item is retrieved from the

distribution information-provider database 312 and

transmitted to the user terminal 6#i by way of the

Information-distribution execution processing unit 306

and the user-interface processing unit 150. Typically,

the transmitted detailed information is information on

coupons.

[0069]

At a step S8 of the flowchart shown in Fig. 11, the

information-distribution management unit 25 carries out

the following processing. At a step S106 of the flowchart

shown in Fig. 15, the following processing is carried out.

The information-provider analysis processing unit 354

saves the user's response to distributed information such

as a selected coupon item in the user response result

master database 378. The user analysis processing unit

352 shown in Fig. 10 analyzes the user's favorites stored

in the distribution log database 314 and records a result

of the analysis in the user analysis log database 380.

The information-provider analysis processing unit 354

analyzes information providers stored in the user

response result master database 378 and the distribution

information-provider database 312, being related to the

favorites of the user, and records a result of the analysis in the information-provider analysis log database 382.

[0070]

At a step S108 of the flowchart shown in Fig. 15, the following processing is carried out. The response-attribute analysis processing unit 356 analyzes attributes stored in the user response result master database 378 and the distribution log database 314, and records a result of the analysis in the response-attribute analysis log database 384. The analyzed attributes include the length of time to the user's response to distributed information and next positional information that gets a response. The analysis-result edit processing unit 358 finds favorites for improving the effects of notification using priority levels of an information-providing menu and the contents of provided information, and stores a result of the analysis in the analysis result database 386. The priority levels of an information-providing menu and the contents of provided information are stored in the user analysis log database 380, the information-provider analysis log database 382 and the response-attribute analysis log database 384.

[0071]

The analysis-result-report-writing processing unit 362 creates a report 388 from data stored in the analysis result database 386. At a step S110, on the basis of the report 388, a result of the favorite calculation is reflected in the user information. The analysis-result communication processing unit 360 transmits an analysis result stored in the analysis result database 386 to the information-provider terminal 4#i by way of the information-provider interface processing unit 200.

[0072]

(8): User's Request for Urgent Providing of Information

Fig. 51 is a block diagram showing functions, which are carried out when the user makes a request for urgent transmission of information. When the user desires information now, the user needs to press the URGENT button appearing on the screen shown in Fig. 34 and enter a special number in order to indicate a level of urgency. The information-provider-candidate extraction determination processing unit 272 determines candidate information providers on the basis of the user's present position stored in the user present location database 280, the user's desired information category stored in the user registration service category master database 172, the information providers' present positions stored in

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the information-provider location database 290 and
provided-information categories stored in the
registration-information category master database 212,
and stores the candidate information providers in the
candidate information-provider database 292. The
information-provider determination processing unit 274
determines an information provider proper for the degree
of urgency, that is, the level of the request made by the
user, and stores the determined information provider in
the information-provider database 294.

[0073]

If a condition for information specified in a
request made by the user and/or a condition for
permissiveness of the request are lenient, the range of
allowance for a distance from the present location of the
user to the position of a proper information provider can
be considered to be a wide range, that is, it is possible
to increase a radius of a circle having the present
location of the user as a center point and enclosing an
area in which candidate information providers are located.
If a condition for information specified in a request
made by the user and/or a condition for permissiveness of
the request are strict, on the other hand, the radius of
such a circle is decreased. The Information-distribution

processing management unit 304 then reads out information

on the determined information provider from the

information-provider database 294, transmits the

information to the user making the request for

distribution of information and records the transmission

in the distribution log database 314.

[0074]

(9): Inter-bank Financial Settlements

Fig. 52 is diagrams each showing a sequence of

inter-bank financial settlement operations. To be more

specific, Fig. 52(a) is a diagram showing a sequence of

inter-bank financial settlement operations for a case in

which the information-provider terminal is a non-mobile

terminal. In this case, the computer system requests the

non-mobile information-provider terminal to pay an

information-provider monthly fee. The computer system

requests a mobile user terminal to pay a user monthly fee

through the mobile-communication enterprise. In the

inter-bank financial settlement, the computer system

requests an information provider and a user to pay their

monthly fees through their financial-transaction

institutions.

[0075]

Fig. 52(b) is a diagram showing a sequence of

inter-bank financial settlement operations for a case in which the information-provider terminal is a mobile terminal. In this case, the computer system requests the non-mobile information-provider terminal to pay an information-provider monthly fee through the mobile-communication enterprise. The computer system requests a mobile user terminal to pay a user monthly fee also through the mobile-communication enterprise. In the inter-bank financial settlement, the computer system requests an information provider and a user to pay their monthly fees through their financial-transaction institutions.

[0076]

Fig. 52(c) is a diagram showing a sequence of inter-bank financial settlement operations for a case in which the computer system also carries out network financial works and each user has an account in a network bank. In this case, the computer system requests the non-mobile information-provider terminal to pay an information-provider monthly fee. The computer system requests a mobile user terminal to pay a user monthly fee through the mobile-communication enterprise. In the inter-bank financial settlement, when the financial-transaction institution of a user requests the network

bank to make a payment, the network bank makes the payment to the financial-transaction institution and a process to make a payment to the financial-transaction institution of the computer system is carried out.

[0077]

First Embodiment

Fig. 53 is a diagram showing the configuration of an information distribution service system implemented by a first embodiment of the present invention. The configuration elements of the first embodiment essentially identical to those employed in the information distribution system shown in Fig. 1 are denoted by the same reference numerals as their counterparts employed in the information distribution system. In the case of the first embodiment, user terminals 6#1 and 6#3 are each a non-GPS terminal whereas a user terminal 6#2 is a GPS terminal. The user of the user terminal 6#2 desires information on shopping such as restaurants and supermarkets. On the other hand, the user of the user terminal 6#1 desires information on areas such as information on traffic and information on accidents. The information on shopping is stored in the information-provider database 30 included in the computer system 2 as shown in Fig. 29 in the basic sequence of

operations carried out between a information-provider terminal 4#i owned by the information provider and the computer system 2 as shown in Fig. 29. In the basic sequence shown in Fig. 29, a recommended information such as information on positions, the information on shopping and information on coupons is transmitted to the computer system 2.

[0078]

On the other hand, the computer system 2 acquires area information such as traffic information and accident information, which vary from time to time, from a traffic center, and stores the information on areas in the area-information database 32. In the case of the information on areas, the locations of the areas and the contents of the information reflect the location of the information provider and information provided by the information provider. Thus, the information on areas is virtually the same as the information provided by the information provider.

[0079]

(1): GPS User Terminal 6#2

In the case of a GPS user terminal, a service is rendered in accordance with the sequence shown in Fig. 32. The user of the GPS user terminal 6#2 desires

presentation of information on shopping. The computer

system 2 derives an inference formula for predicting a

moving destination from positional information of the GPS

user terminal 6#2 by adoption of the inference mechanism

described earlier.

[0080]

Fig. 54 is a diagram showing a screen displaying

detailed information. The computer system 2 finds out a

proper information provider by adoption of the least-

square method described above and in accordance with from

the position of the GPS user terminal 6#2. Then, pieces

of detailed information for the information category

specified by the GPS user terminal 6#2 are transmitted in

a distribution order. The detailed information includes

the names of department stores, supermarkets and

restaurants. The department stores, the supermarkets and

the restaurants pertain to the information category,

which is the shopping-information category in this case.

The GPS user terminal 6#2 displays the detailed

information on a screen like one shown in Fig. 54. In the

case of a department store, a supermarket or the like,

information on a coupon and information on buying at a

bargain are also distributed as well.

[0081]

(2): Non-GPS User Terminal 6#1

In the case of a non-GPS user terminal, a service
is rendered in accordance with the sequence shown in Fig.
33. The user of the non-GPS user terminal 6#1 desires
presentation of information on areas such as information
on traffic and information on accidents. The computer
system 2 acquires the area information such as the
traffic information and the accident information, which
vary from time to time, from a traffic center, and stores
the information on areas in the area-information database
32.

[0082]

Fig. 55 is a diagram showing a screen displaying
detailed information. The computer system 2 derives an
inference formula for predicting a moving destination
from positional information of the non-GPS user terminal
6#1, which is positional information received via the
mobile-communication enterprise. The computer system 2
transmits information on an area such as information on
traffic and information on accidents in accordance with
the information category desired by the non-GPS user
terminal 6#1. The area is an area surrounding the
position of the non-GPS user terminal 6#1. The position
of the non-GPS user terminal 6#1 is predicted by using

the enterprise formula. The GPS user terminal 6#1

displays the detailed area information on a screen like

the one shown in Fig. 55.

[0083]

In accordance with the first embodiment described

above, it is possible to easily obtain information on an

area existing on the way in the moving direction without

specifying a destination of the movement. In addition,

even in the case of mobile information terminals existing

in the same region, information on an area may or may not

be distributed depending on the moving direction. Thus,

the amount of distributed information can be reduced.

[0084]

Second Embodiment

Fig. 56 is a diagram showing the configuration of

an information distribution service system implemented by

a second embodiment of the present invention. The

configuration elements of the second embodiment

essentially identical to those employed in the

information distribution system shown in Fig. 1 are

denoted by the same reference numerals as their

counterparts employed in the information distribution

system. Fig. 57 is a block diagram showing functions of a

computer system 450 employed in the information

distribution service system shown in Fig. 56.

Configuration elements of the computer system 450 that

are essentially identical to those employed in the

computer system 2 shown in Fig. 2 are denoted by the same

reference numerals as their counterparts employed in the

computer system 2. In addition to the functions of the

position management unit 22 employed in the first

embodiment, a position management unit 460 has the

following additional functions:

(i): Identify an area predicted to be a specific area,

toward which users are moving, from predicted moving

directions of users, and identify user terminals 6#i

moving to the specific area.

(ii): Inform the mobile-communication enterprise of a map

code of the specific area toward which users are

intensively moving, that is, information on the specific

area and the phone number or the terminal address or each

user terminal inferred to be moving toward the specific

area.

[0085]

Since the amount of traffic in the specific area

toward which users are moving is predicted to increase,

the mobile-communication enterprise is notified of the

fact that the traffic will become heavier so that the

mobile-communication enterprise can take a proactive measure such as a regulation to suppress traffic congestion. For example, the mobile-communication enterprise can notify users of information on a traffic regulation so that the users avoid moving in the direction toward the area.

[0086]

Fig. 58 shows a flowchart representing processing of position management. Fig. 59 shows a user sequence chart. The user terminal 6#i transmits a request to start a service to the computer system 450 as indicated by an arrow (250) of the sequence shown in Fig. 59. The user terminal 6#i transmits a position-registration notification to the computer system 450 as indicated by an arrow (252). At a step S600 of the flowchart shown in Fig. 58, the position management unit 460 employed in the computer system 450 forms a judgment as to whether or not positional information has been received. If the positional information has been received, the flow of the processing goes on to a step S602. If the positional information has not been received, on the other hand, the processing is ended. Then, at the next step S604, a process to infer the user's moving direction and movement time is carried out by adopting the inference method

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described above.

[0087]

Subsequently, at the next step S606, a judgment is formed to determine whether or not users the number of which exceeds a predetermined user count are moving in the moving direction toward the same area. If users the number of which exceeds a predetermined user count are moving in the moving direction toward the same area, the flow of the processing goes on to a step S608. If users the number of which exceeds a predetermined user count are not moving in the moving direction toward the same area, on the other hand, the flow of the processing goes on to a step S610. At the step S608, the map code of the area and the terminal address of each of the users are reported to the mobile-communication enterprise as indicated by an arrow 254 of the sequence shown in Fig. 59.

[0088]

Since the amount of traffic in the area is predicted to increase, upon reception of the map code, the mobile-communication enterprise notifies the user terminal through the terminal address that traffic will be regulated by taking a step such as limiting a traffic flow as indicated by an arrow (256) of the sequence shown

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in Fig. 59. From this notification, the user terminal

knows in advance that the amount of traffic at the moving

destination will increase. At the step S610, an area

information database is searched for information

corresponding to the moving direction and the movement

time. Then, at the next step S612, an information menu

stored in the user database is edited on the basis of the

category information. Subsequently, at the next step S614,

the information menu is transmitted to the terminal.

[0089]

In accordance with the second embodiment described

above, not only are the same effects as the first

embodiment exhibited, but a preventive measure can also

be taken in case concentration of traffic in a certain

area is predicted in advance.

[0090]

Third Embodiment

Fig. 60 is a diagram showing the configuration of

an information distribution service system implemented by

a third embodiment of the present invention. The

configuration elements of the third embodiment

essentially identical to those employed in the

information distribution system shown in Fig. 1 are

denoted by the same reference numerals as their

counterparts employed in the information distribution system.  Fig. 61 is a block diagram showing functions of a computer system 500 employed in the information distribution service system shown in Fig. 60. Configuration elements of the computer system 500 that are essentially identical to those employed in the computer system 2 shown in Fig. 2 are denoted by the same reference numerals as their counterparts employed in the computer system 2.  In addition to the functions of the position-management unit employed in the first embodiment, a position management unit 510 has the following additional functions:

(i):  Form a judgment as to whether or not a user is riding on a vehicle such as a train or a bus on the basis of data stored in a vehicle operation information database included in the area-information database 32, a moving direction and a movement time, and identify what kind of vehicle is used if the user is riding on a vehicle.

(ii):  Identify what vehicle the user is riding on, on the basis of data stored in a vehicle operation information database.

(iii):  Edit an information menu including an arrival time of the identified vehicle and information on an area in

which a destination station of the vehicle is located.

[0091]

The vehicle operation information database included in the area-information database 32 includes route information showing operation routes and an operation time table of each route. The route information is information on locations located on a contiguous line and information on allowable displacements. Examples of the contiguous line are a trunk road, an express way and a rail road. Provided for each vehicle running through a route, operation information for the route includes the name of each place at which the vehicle will arrive and the geographical location of such a place as well as an operation time, that is, a time of arrival at the place.

[0092]

Fig. 62 shows a flowchart representing a processing of position management. Fig. 63 is a diagram showing a screen displaying detailed information. At a step S700 of the flowchart shown in Fig. 62, the position management unit 510 forms a judgment as to whether or not positional information has been received. If the positional information has been received, the flow of the processing goes on to a step S702. If the positional information has not been received, on the other hand, the processing is

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ended.  Then, at the next step S704, a process to infer

the user's moving direction and movement time is carried

out by adopting the inference mechanism described above.

Subsequently, at the next step S706, a judgment is formed

to determine whether or not the moving direction is to be

compared with the operation route of a vehicle.  If the

moving direction is to be compared with the operation

route of a vehicle, the flow of the processing goes on to

a step S708.  If the moving direction is not to be

compared with the operation route of a vehicle, on the

other hand, the flow of the processing goes on to a step

S714.  At the step S708, the moving direction is compared

with the operation route of a vehicle to determine

whether or not the moving direction coincides with the

operation route of a vehicle.  If the moving direction

coincides with the operation route of a vehicle, the flow

of the processing goes on to a step S710.  If the moving

direction does not coincide with the operation route of a

vehicle, on the other hand, the flow of the processing

goes on to the step S714.  This is because a vehicle

cannot be identified.

[0093]

At the step S710, the vehicle, which the user is

riding on, is identified, and the vehicle-operation data

base is searched for information on vehicle operations

and information on areas. The pieces of information are

then combined to be used in a work to edit an information

menu. Assume for example that the vehicle is a train. In

this case, the vehicle-operation database is searched for

information on stations on the way to the destination and

a time of arrival at the terminal station, guiding

information showing transfer stations as well as

information on delays caused by an accident or the like.

These pieces of information are included in the

information menu. In addition, the area-information

database 32 is also searched for information on an area

surrounding each of the stations. Such information can

also be included in the information menu.

[0094]

The above description for a train is applicable to

a public bus used as a vehicle. Then, at a step S712, the

information menu is transmitted to the terminal. At the

step S714, the area-information database is searched for

data for the moving direction and the movement time. Then,

at the next step S716, an information menu is edited on

the basis of category information retrieved from the user

database. Subsequently, at a step S718, the information

menu is transmitted to the terminal. As shown in Fig. 63,

the screen displays, among others, an item for

information on train changes.

[0095]

In accordance with the third embodiment described

above, not only are the same effects as the first

embodiment exhibited, but it is also possible to obtain

travel-destination information according to operation

information of a vehicle the user is riding on.

[0096]

Fourth Embodiment

Fig. 64 is a diagram showing the configuration of

an information distribution service system implemented by

a fourth embodiment of the present invention. The

configuration elements of the fourth embodiment

essentially identical to those employed in the

information distribution system shown in Fig. 1 are

denoted by the same reference numerals as their

counterparts employed in the information distribution

system. Fig. 65 is a block diagram showing functions of a

computer system 550 employed in the information

distribution service system shown in Fig. 64.

Configuration elements of the computer system 550 that

are essentially identical to those employed in the

computer system 2 shown in Fig. 2 are denoted by the same

reference numerals as their counterparts employed in the computer system 2. In addition to the functions of the position-management unit employed in the first embodiment, a position management unit 560 has the following additional functions:

(i): Find a moving speed from information on positions along the time series and, from the moving speed, determine whether the user is walking or riding on a vehicle moving at a high speed such as an automobile.

(ii): Select candidates for a moving destination on the basis of the moving direction of the user and on the basis of whether or not the user is riding on a vehicle. If the user is riding on a car, for example, the candidates for the moving destination are limited to locations within a distance of not longer than 10 km from the user in the moving direction.

(iii): Edit an information menu including information on the area of each candidate for the moving destination.

[0097]

Fig. 66 shows a flowchart representing a position-registration process. Fig. 67 is a diagram showing a screen displaying detailed information. At a step S800 of the flowchart shown in Fig. 66, the position management unit 560 forms a judgment as to whether or not

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information on a position has been received. If

information on a position has been received, the flow of

the processing goes on to a step S802. If information on

a position has not been received, on the other hand, the

processing is ended. At a step S804, the user's moving

direction and movement time are inferred by using the

inference method described earlier. Then, the flow of the

processing goes on to the next step S806 to form a

judgment as to whether or not the moving speed of the

user is to be compared with that of a vehicle. If the

moving speed of the user is to be compared with that of a

vehicle, the flow of the processing goes on to a step

S808. If the moving speed of the user is not to be

compared with that of a vehicle, on the other hand, the

flow of the processing goes on to a step S810. At the

step S808, the moving speed of the user is examined to

determine whether the user is walking or riding on a

vehicle.

[0098]

At the step S810, the area-information database 32

is searched for information appropriate for the moving

direction and the movement time. If the user is riding on

a car, for example, the candidates for the moving

destination are limited to locations within a distance of

not longer than 10 km from the user in the moving

direction.  If a bathing resort is selected as a candidate

for the moving destination, an expected time of arrival

at the bathing resort, the state of road traffic

congestion and information on a by-road are searched for.

At a place where the user is further approaching the

bathing resort, the amount of additional information is

increased.  Examples of the additional information include

an expected time of arrival at the bathing resort, the

state of road traffic congestion, information on a by-

road and information on available parking lots.  At a

place where the user is further approaching the vicinity

of the bathing resort, information on available parking

lots, information on the bathing resort and information

on restaurants classified by business hour are searched

for as detailed information.  In addition, if there is a

plurality of available parking lots, a parking lot

convenient for parking a car running in the moving

direction is selected at a high priority level.  Fig. 67

shows information on a bathing resort, information on a

parking lot close to the bathing resort, information on

seaside house and information on restaurants.  In the

above description, a bathing resort is explained as an

example.  Conceivable destinations other than a bathing

resort include an amusement park, a skiing ground, a golf course and an airport.

[0099]

If the user is walking, on the other hand, the candidates for the moving destination are limited to locations within a distance of not longer than 1 km from the user in the moving direction. If a department store is selected as a candidate for the destination, an expected time of arrival at the department store and information on bargain sales are searched for as detailed information. At a place where the user is further approaching the department store, additional information is searched for as menu information. The additional information includes an expected time of arrival at the department store and information on seasonal bargain sales during a specified period of time such as a bargain-sale place, commodities sold at a bargain and their bargain prices. At a place where the user is further approaching the vicinity of the department store, information on seasonal bargain sales during a specified period of time and information on coupons are acquired as detailed information.

[0100]

In accordance with the fourth embodiment described

above, not only are the same effects as the first
embodiment exhibited, but it is also possible to render a
service of distributing detailed information in a range,
which varies depending on whether the user is walking or
riding on a vehicle.

[0101]

Fifth Embodiment

Fig. 68 is a diagram showing the configuration of
an information distribution service system implemented by
a fifth embodiment of the present invention. The fifth
embodiment's configuration elements essentially identical
to those employed in the information distribution system
shown in Fig. 1 are denoted by the same reference
numerals as their counterparts employed in the
information distribution system. Fig. 69 is a block
diagram showing functions of a computer system 600
employed in the information distribution service system
shown in Fig. 68. Configuration elements of the computer
system 600 that are essentially identical to those
employed in the computer system 2 shown in Fig. 2 are
denoted by the same reference numerals as their
counterparts employed in the computer system 2. Fig. 70
is a block diagram showing functions of a information-
provider management unit 650 employed in the computer

system 600 shown in Fig. 69, which are functions carried

out for a response given by the user. Figs. 71 and 72 are

diagrams showing the configurations of store-management

systems 610 and 620 respectively, employed in the

information distribution service system shown in Fig. 68.

[0102]

Fig. 73 shows a sequence of operations carried out

by the user. As indicated by an arrow (300) of the

sequence shown in Fig. 73, the user terminal 6#i

transmits a request for a start of a service to the

computer system 600. As indicated by an arrow (304), the

computer system 600 transmits an information menu to the

user terminal 6#i. As indicated by an arrow (306), the

user terminal 6#i transmits selected information to the

computer system 600. As indicated by an arrow (308), the

computer system 600 transmits detailed information to the

user terminal 6#i. As indicated by an arrow (310), the

user terminal 6#i transmits a response to the information

notification. In this case, the distributed-information

user-response reception processing unit 350 shown in Fig.

70 receives the response from the user-interface

processing unit 150 and stores the response in the user

response result master database 378. The response

includes a result of the user's response to the

distributed information.

[0103]

A user analysis processing unit 352 analyzes a user
on the basis of information stored in the user response
result master database 378 and information stored in the
target-user database 310, and stores a result of the
analysis in the user analysis log database 380. A user-
displacement-speed computation processing unit 700
searches the user location displacement database 284 for
positional displacements of the responding user, the
response given by which is stored in the user response
result master database 378. The positional displacements
are used as a basis for finding the moving speed of the
user. An inferred-distance computation processing unit
702 computes an estimated distance to the location of an
information provider responded by the user, the response
given by which is stored in the user response result
master database 378, from information stored in the
distribution information-provider database 312. An
estimated-arrival-time computation processing unit 704
finds an expected time of arrival from the moving speed
of the user and the estimated distance and stores the
expected time of arrival in the inferred-user-arrival-
time database 750.

[0104]

A response-result-edit processing unit 680 finds an accurate expected time of arrival to the information provider from information stored in an inferred-user-arrival-time database 750 and a response-attribute analysis log database 384 particularly used for storing, among other data, a time at which the user responds. The response-result-edit processing unit 680 then edits items to be reported to other information providers and stores the edited item in a response-result database 722. A response-result-notification processing unit 682 transmits the response result stored in the response-result database 722 to the information provider by way of the information-provider interface processing unit 200 as indicated by an arrow (312) of a sequence shown in Fig. 73. The store management system 610 or 620 of the information provider receives the response result.

[0105]

(a): Restaurant Serving as an Information Provider of the Store Management System 610

If the information provider is a restaurant, the provided information includes a recommended menu, a seat reservation and a parking lot reservation. On the other hand, responses shown by the user are food orders. A

response notification given by the computer system 600 includes a time at which the user reacted, the user's registered name or ID and an expected time of arrival at the restaurant in addition to the user's response itself. An information-processing apparatus 800 employed in the store management system 610 shown in Fig. 71 displays a parking lot reservation and a seat reservation on a parking lot display unit 804 and a seat display unit 806 respectively, the user's expected time of arrival and ordered food on a kitchen display unit 808 and information such as the name of the user, the number of the people in the party, the expected time of arrival and a menu of foods for reservation on a staff-room display unit 810 through a display-unit-driving control apparatus 802.

[0106]

Receiving the response notification, the store management system 610 gives a response, which shows that the response notification has been received, as indicated by an arrow 314 of the sequence shown in Fig. 73. The computer system 600 passes on the reception response received from the store management system 610 (the information provider) to the user terminal 6#i as a response notification as indicated by arrows (316). As

such, the information provider allows restaurant kitchen staffs to know the user's reserved food menu and expected time of arrival. In this case, by the information provider, collaboration between a job management system and the present invention is realized. Thus, the aim of the preparation work becomes obvious, and since the user's expected time of arrival is known, service staffs can render a service to serve customers smoothly. That is to say, the work efficiency of the restaurant business can be improved and the profit can hence be increased. In addition, the user no longer worries about the availability of a parking lot and the availability of a seat and can expect that the time to wait for the foods to become ready is reduced substantially.

[0107]

(b): A Retailer/Distributor Serving as the Information Provider of the Store Management System 620

If the information provider is a vendor, the provided information is a message saying: "A discount rate varying depending on a time between the user's expected time of arrival at the store and a commodity-purchasing time is applied." For example, "a discount rate of 50%, 40% or 30% is applied if a time between the user's expected time of arrival at the store and a

commodity-purchasing time is no more than 10 minutes, 20

minutes or 30 minutes respectively," or a message saying:

"If this is clicked, an expected time of arrival at the

store and an electronic coupon to be submitted to the

cashier are displayed. So, submit the coupon to the

cashier when you make a purchase payment." As the user's

response to such provided information, the user clicks a

predetermined portion of the screen. A response

notification issued by the computer system 600 includes a

time at which the user reacted and an expected time of

arrival at the store in addition to the user's response

itself. A sales management processing system 820 employed

in the store management system 620 shown in Fig. 72

informs an inventory management system 822 and a POS

management system 824 of a commodity to which a discount

rate is applicable as indicated in the response

notification.

[0108]

Receiving the response notification, the store

management system 620 gives a response, which shows that

the response notification has been received, as indicated

by an arrow 314 of the sequence shown in Fig. 73. The

computer system 600 passes on the reception response

received from the store management system 620 (the

information provider) to the user terminal 6#i as a response notification as indicated by arrows (316). For example, assume that the expected time of arrival at the store is OO:OO to OO:OO. In this case, if the time of a payment for a purchased commodity B to the cashier is within 10 minutes, 20 minutes or 30 minutes from the expected time of arrival at the store, a discount rate of 50%, 40% or 30% respectively is applied. When making the payment, submit what is displayed this time to the cashier.

[0109]

In addition, a technique of selling commodities in accordance with a weather forecast and/or a road condition can increase the efficiency. For example, tire chains are required due to a fall of snow in a certain area and areas in the north of the certain area. In this case, a store selling tire chains distributes information urging the user moving to those areas to make a reservation for purchasing tire chains. For a user making such a reservation, tire chains are then reserved separately from those displayed at the shop.

[0110]

As described above, the present invention specifies an enterprise, which provides information desired by a

user to the user, by predicting a moving direction of the

user through adoption of an inference mechanism and

identifying information providers existing in an area in

the predicted moving direction. Examples of the

enterprise providing information are a food and drink

enterprise, a parking-lot enterprise, a retailing

enterprise and a distribution enterprise. By

collaboration between the present invention and a job

management system, the information provider is capable of

discovering a new selling technique that cannot be

adopted with the conventional system and, at the same

time, the management efficiency can be improved and the

profit can hence be increased. That is to say, the effect

of the present invention on industries is profound.

[0111]

The scope of the present invention includes the

following things.

[0112]

(Appendix 1) An information distribution service system

comprising a plurality of mobile information terminals, a

computer system and a plurality of information-provider

terminals wherein said mobile information terminals, said

computer system and said information-provider terminals

are connected to each other by a communication network,

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said information distribution service system

characterized in that:

said computer system predicts a mobile information

terminal's moving destination and moving direction by

inferring said mobile-information terminal's positional

displacements along the time axis on the basis of

information on positions of said mobile information

terminal including a pre-registered information category

whose information distribution service, distribution and

notification are desired, and on the basis of an

inference formula provided in advance with said mobile

information terminal's moving direction and position; and

said computer system determines an information-

provider terminal predicted to exist at said predicted

moving destination of said mobile information terminal on

the basis of locations of information-provider terminals

pre-recording plans to distribute information as a

notification, and determines distributed and reported

information corresponding to an information category

registered in advance by said mobile information terminal

among pieces of information to be provided by said

selected information-provider terminal.

[0113]

(Appendix 2)  An information distribution service system

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according to appendix 1, said information distribution service system characterized in that:

said computer system is provided with an inference formula for predicting a moving direction for each geographical position with said geographical position taken as an origin on the basis of map information; and

said computer system, if existence at an origin to which an inference formula is applied is confirmed on the basis of information on positions of said mobile information terminal, infers prediction of said mobile information terminal's moving destination and moving direction on the basis of said inference formula.

[0114]

(Appendix 3) An information distribution service system according to appendix 1, said information distribution service system characterized in that each of a plurality of said inference formulas is defined on the basis of map information having a plurality of scale factors.

[0115]

(Appendix 4) An information distribution service system according to appendix 1, said information distribution service system characterized in that said computer system executes the steps of:

regarding said defined inference formula as an

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equation representing a regression straight line;

finding a distance between a position represented by said reference formula and the location of said information-provider terminal by adoption of a least-square method; and

determining that an information-provider terminal exists in the vicinity of said predicted moving destination of said mobile information terminal if said distance is in an allowable range determined for said defined inference formula.

[0116]

(Appendix 5) An information distribution service system according to appendix 1, said information distribution service system characterized in that said computer system forms a judgment as to whether or not an inference formula defined on the basis of information on positions of said mobile information terminal is proper and, if said defined inference formula is found improper, a new inference formula is defined.

[0117]

(Appendix 6) An information distribution service system according to appendix 1, said information distribution service system characterized in that, if it is impossible to determine an inference formula for predicting said

mobile information terminal's moving direction and
position from positional displacements of said mobile
information terminal with each geographical position used
as an origin on the basis of map information, said
computer system finds an inference formula for predicting
said mobile information terminal's most recent moving
destination and most recent moving direction each time
most recent information on a position of said mobile
information terminal is obtained.

[0118]

(Appendix 7)  An information distribution service system
according to appendix 1, said information distribution
service system characterized in that, if an inference
formula, which is found as an equation for predicting
said mobile information terminal's moving destination and
moving direction each time most recent information on a
position of said mobile information terminal is obtained,
changes very frequently in a time series, said computer
system predicts a polarity of a movement of said mobile
information terminal by application of a partial
derivative and on the basis of said mobile information
terminal's positional information accumulated in the past.

[0119]

(Appendix 8)  An information distribution service system

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according to appendix 1, said information distribution service system characterized in that, if said mobile information terminal makes an urgent request for information on a place in an area at which said mobile information terminal is currently located, said computer system transmits said information based on most recent information on a position of said mobile information terminal.

[0120]

(Appendix 9) An information distribution service system according to appendix 1, said information distribution service system characterized in that said computer system executes the steps of:

informing a mobile-communication enterprise of information on a mobile information terminal moving to a position at a place in an area at and/or in said mobile information terminal's moving destination and/or moving direction predicted on the basis of an inference formula defined from information on positions of said mobile information terminal;

finding a moving speed of said mobile information terminal from positional information accumulated in the past;

informing an information-provider terminal inferred

to be a terminal located at said mobile information terminal's moving destination of an expected time of arrival of said mobile information terminal at said moving destination where said expected time of arrival is a time predicted by using an inference formula based on a present position of said mobile information terminal;

determining moving means, on which a user of said mobile information terminal is riding, from a combination of said mobile information terminal's moving speed and displacements in positional information; and

informing said mobile-information terminal of operational information obtained from an enterprise managing operations of said moving means.

[0121]

(Appendix 10) An information distribution service system according to appendix 1, said information distribution service system characterized in that said computer system receives a response to information transmitted to said mobile information terminal as a notification from said mobile information terminal and records, separates as well as analyzes said response.

[0122]

(Appendix 11) An information distribution service system according to appendix 1, said information

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distribution service system characterized in that said computer system informs said information-provider terminal of a result of an analysis of said response by said mobile information terminal.

[0123]

(Appendix 12) An information distribution service system according to appendix 11, said information distribution service system characterized in that said computer system carries out a statistical analysis to improve a priority order of distributed notifications, contents of information and inference precision on the basis of a response by said mobile information terminal, attributes and category information, which have been registered by the user, and contents of a notification distributed by said information-provider terminal.

[0124]

[Effects of the Invention]

In accordance with the present invention described above, it is possible to easily obtain information on an area existing on the way in the moving direction without specifying a destination of the movement. In addition, even in the case of mobile information terminals existing in the same region, information on an area may or may not be distributed depending on the moving direction. Thus,

the amount of distributed information can be reduced. Furthermore, distribution of information and mobile information terminals can be controlled in conjunction with a mobile-communication enterprise.

[Brief Description of the Drawings]

[Fig. 1]

Fig. 1 is a diagram showing the basic configuration of an information distribution system provided by the present invention;

[Fig. 2]

Fig. 2 is a diagram showing the configuration of a computer system employed in the information distribution system shown in Fig. 1;

[Fig. 3]

Fig. 3 shows block diagrams each showing functions of an information-provider terminal employed in the information distribution system shown in Fig. 1;

[Fig. 4]

Fig. 4 shows block diagrams each showing functions of a user terminal employed in the information distribution system shown in Fig. 1;

[Fig. 5]

Fig. 5 is a block diagram showing functions

relevant to user management and position management;

[Fig. 6]

Fig. 6 is a block diagram showing functions relevant to information management;

[Fig. 7]

Fig. 7 is a block diagram showing functions relevant to position management;

[Fig. 8]

Fig. 8 is a block diagram showing other functions relevant to position management;

[Fig. 9]

Fig. 9 is a block diagram showing further functions relevant to position management;

[Fig. 10]

Fig. 10 is a block diagram showing functions relevant to information-provider management;

[Fig. 11]

Fig. 11 shows a flowchart representing processing carried out by the computer system;

[Fig. 12]

Fig. 12 shows a flowchart representing processing of user management;

[Fig. 13]

Fig. 13 shows a flowchart representing processing

of information management;

[Fig. 14]

Fig. 14 shows a flowchart representing processing of position management;

[Fig. 15]

Fig. 15 shows a flowchart representing processing of information-provider management;

[Fig. 16]

Fig. 16 shows a flowchart representing processing carried out by a user terminal;

[Fig. 17]

Fig. 17 shows a flowchart representing a process to register a user terminal;

[Fig. 18]

Fig. 18 shows a flowchart representing a process to report information on a position;

[Fig. 19]

Fig. 19 shows a flowchart representing information-display execution processing;

[Fig. 20]

Fig. 20 shows a flowchart representing processing carried out by the information-provider terminal;

[Fig. 21]

Fig. 21 shows a flowchart representing a process to

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register information;

[Fig. 22]

Fig. 22 shows a flowchart representing a process to change an information display;

[Fig. 23]

Fig. 23 shows a flowchart representing a process to delete information;

[Fig. 24]

Fig. 24 is a diagram showing structures of data transmitted by the computer system to a user terminal;

[Fig. 25]

Fig. 25 is a diagram showing structures of data transmitted to the computer system by a user terminal;

[Fig. 26]

Fig. 26 is a diagram showing structures of data transmitted by the computer system to an information-provider terminal;

[Fig. 27]

Fig. 27 is a diagram showing structures of data transmitted to the computer system by an information-provider terminal;

[Fig. 28]

Fig. 28 is a diagram showing a basic sequence shown in a process to register user information;

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Fig. 36 is a diagram showing a selection menu screen for an information provider;

[Fig. 37]

Fig. 37 is a diagram showing an information-registration screen for an information provider;

[Fig. 38]

Fig. 38 is a diagram showing an information menu screen of a user terminal;

[Fig. 39]

Fig. 39 is a diagram showing an information-registration screen for an information provider;

[Fig. 40]

Fig. 40 is a diagram showing a user-registration completion screen for an information provider;

[Fig. 41]

Fig. 41 is a diagram showing an information-display-changing screen (category selection) for an information provider;

[Fig. 42]

Fig. 42 is a diagram showing an information-display-changing screen (displaying detailed information) for an information provider;

[Fig. 43]

Fig. 43 is a diagram showing an information-

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changing completion screen for an information provider;

[Fig. 44]

Fig. 44 is a diagram showing an information-deletion screen (category selection) for an information provider;

[Fig. 45]

Fig. 45 is a diagram showing an information-deletion screen (displaying detailed information deletion) for an information provider;

[Fig. 46]

Fig. 46 is a diagram showing an information-deletion screen (displaying detailed information deletion) for an information provider;

[Fig. 47]

Fig. 47 is a diagram showing an information-deletion completion screen for an information provider;

[Fig. 48]

Fig. 48 is a diagram showing an inference mechanism;

[Fig. 49]

Fig. 49 is a diagram showing an inference mechanism for a curved road;

[Fig. 50]

Fig. 50 is a diagram showing an inference mechanism

for a grid-like road;

[Fig. 51]

Fig. 51 is a block diagram showing functions, which are carried out when the user makes a request for urgent transmission of information;

[Fig. 52]

Fig. 52 is diagrams each showing a sequence of inter-bank financial settlement operations;

[Fig. 53]

Fig. 53 is a diagram showing the configuration of an information distribution service system implemented by a first embodiment of the present invention;

[Fig. 54]

Fig. 54 is a diagram showing a screen displaying detailed information;

[Fig. 55]

Fig. 55 is a diagram showing a screen displaying detailed information;

[Fig. 56]

Fig. 56 is a diagram showing the configuration of an information distribution service system implemented by a second embodiment of the present invention;

[Fig. 57]

Fig. 57 is a block diagram showing functions of a

computer system employed in the information distribution service system shown in Fig. 56;

[Fig. 58]

Fig. 58 shows a flowchart representing processing of position management;

[Fig. 59]

Fig. 59 shows a user sequence chart;

[Fig. 60]

Fig. 60 is a diagram showing the configuration of an information distribution service system implemented by a third embodiment of the present invention;

[Fig. 61]

Fig. 61 is a block diagram showing functions of a computer system employed in the information distribution service system shown in Fig. 60;

[Fig. 62]

Fig. 62 shows a flowchart representing processing of position management;

[Fig. 63]

Fig. 63 is a diagram showing a screen displaying detailed information;

[Fig. 64]

Fig. 64 is a diagram showing the configuration of an information distribution service system implemented by

a fourth embodiment of the present invention;

[Fig. 65]

Fig. 65 is a block diagram showing functions of a computer system employed in the information distribution service system shown in Fig. 64;

[Fig. 66]

Fig. 66 shows a flowchart representing processing of position management;

[Fig. 67]

Fig. 67 is a diagram showing a screen displaying detailed information;

[Fig. 68]

Fig. 68 is a diagram showing the configuration of an information distribution service system implemented by a fifth embodiment of the present invention;

[Fig. 69]

Fig. 69 is a block diagram showing functions of a computer system employed in the information distribution service system shown in Fig. 68;

[Fig. 70]

Fig. 70 is a block diagram showing functions of an information-provider management unit employed in the computer system shown in Fig. 69;

[Fig. 71]

Fig. 71 is a diagram showing the configurations of a store-management system employed in the information distribution service system shown in Fig. 68;

[Fig. 72]

Fig. 72 is a diagram showing the configurations of another store-management system employed in the information distribution service system shown in Fig. 68; and

[Fig. 73]

Fig. 73 shows a sequence of operations carried out by the user.

[Description of Reference Numerals]

2: Computer system

4#i where i = 1 and so on: Information-provider terminal

6#i where i = 1 and so on: User terminal

20: User management unit

22: Position management unit

24: Information management unit

25: Information-distribution management unit

26: User-information database

30: Information-provider database

32: Area-information database

34: Inferred-information database

36: Analysis database

[Name of Document]  Abstract

[Abstract]

[Object]  To provide an information distribution service
system for predicting a moving destination and a moving
direction of a user of a mobile information terminal on
the basis of information on positions of the user and
distributing information such as area information
suitable for the predicted moving destination.

[Solving Means]  In an information distribution service
system comprising a plurality of mobile information
terminals, a computer system and a plurality of
information-provider terminals, the computer system is
provided with a user-information database for
registration information categories provided for the
mobile information terminals' users each serving as a
recipient of an information distribution service rendered
by the information distribution service system, an
information-provider database for registering positions
of the information-provider terminals and information to
be distributed by the information-provider terminals as
notifications, and a position management unit provided
for the purpose of inferring changes in position of each
mobile information terminal in a time series by using an
inference formula provided in advance for predicting the

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particular mobile information terminal's moving direction and position on the basis of information on positions of the particular mobile information terminal, and the purpose of determining an information-provider terminal predicted to exist at a predicted destination of the movement of the particular mobile information terminal on the basis of the positions of the information-provider terminals and determining information to be transmitted by the determined information-provider terminal as a notification to the particular mobile information terminal.

[Selected Drawing]  Fig. 2

Fig. 1  Basic configuration

6#1/#n:  Terminal

User

4#n:  Terminal

information provider

8c:  Mobile-communication network

8b:  Internet

2:  ASP

Computer system

8d:  Enterprise network

4#1:  Terminal

information provider

GW:  Gate away

ASP:  Application service provider


Fig. 2  Computer system

12:  Execution processing unit

20:  User management unit

22:  Position management unit

24:  information management unit

25:  Information-distribution management unit

14:  Communication processing unit

16:  Storage unit

26:  User-information DB

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28: User-location DB

30: Information-provider DB

32: Area-information DB

34: Inferred-information DB

36: Analysis DB


Fig. 3  Information-provider terminal

51: Execution processing unit

60: Information-registration processing unit

62: Information-display-execution processing unit

52: Radio-communication processing unit

54: Display unit

56: Storage unit

58: Input unit

70: Communication processing unit


Fig. 4  User terminal configuration

82: Execution processing unit

90: Terminal-registration processing unit

92: Positional-information-reporting processing unit

94: information display execution processing unit

84: Radio-communication processing unit

86: Display unit

88: Storage unit

96: Input unit

100: GPS-apparatus unit


Fig. 5 Functional blocks relevant to user management and position management

150: User-interface processing unit (Service registration)

152: User-service-reception processing unit

154: Registration-service analysis processing unit

156: Registration-menu output processing unit

160: User-position-information reception processing unit

162: User-position-information history management processing unit

170: User master DB

172: User registration service category master DB

180: User-location information master DB

182: User-location information history DB

152:---(Registration request)---156

    (Change request)


Fig. 6 Functional blocks relevant to information management

200: Information-provider interface processing unit

202: Information-provider registration reception

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processing unit

204: registration menu output processing unit

206: Registration-information analysis processing unit

210: Information-provider master DB

212: Registration-information-category master DB

202---(Register) (Change)---204

Fig. 7 Functional blocks relevant to position management

230: Inference-formula generation processing unit

232: Map-information master DB

234: Inference-formula master DB

Fig. 8 Functional blocks relevant to position management

172: User registration service category master DB

182: User-location information history DB

232: Map-information master DB

210: Information-provider master DB

250: Inference-formula determination processing

management unit

260: User-present-position-information determination

processing unit

270: Information-provider-location determination

processing unit

212: Registration-information-category master DB

114

280: User present location DB

234: Inference-formula master DB

290: Information-provider location DB

264: User-displacement-position history processing unit

262: Inference-formula-candidate extraction determination processing unit

272: Information-provider-candidate extraction determination processing unit

284: User location displacement DB

286: Candidate inference-formula DB

292: Candidate information-provider DB

266: Inference-formula determination processing unit

288: Determined-inference-formula DB

274: Information-provider determination processing unit (Determining information provider existing in allowable range of inference formula on the basis of the least-square method)

294: Selected information-provider DB


Fig. 9 Functional blocks relevant to position management

284: User location displacement DB

288: Determined-inference-formula DB

294: Selected information-provider DB

212: Registration-information-category master DB

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294-212: If positional displacement of user is determined to slip out of inference formula, inference-formula determination processing management unit determines to extract new inference formula.

300: User-displacement adequacy check processing unit (Positional displacement conforming to inference formula)

302: Distribution-order determination processing unit (Determining distribution priority order of selected information providers)

310: Target-user DB

312: Distribution information-provider DB

150: User-interface processing unit

304: Information-distribution processing management unit

306: Information-distribution execution processing unit

314: Distribution log DB

Fig. 10 Functional blocks relevant to information-provider management

150: User-interface processing unit

350: Distributed-information user response reception processing unit

310: Target-user DB

312: Distribution target information-provider DB

314: Distribution log DB

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378: User response result master DB

352: User analysis processing unit

354: Information-provider analysis processing unit

356: Response-attribute analysis processing unit

380: User analysis log DB

382: Information-provider analysis log DB

384: Response-attribute analysis log DB

358: Analysis-result edit processing unit

360: Analysis-result communication processing unit

200: Information-provider interface processing unit

386: Analysis result DB

362: Analysis-result-report-writing processing unit

388: Report


Fig. 11

Flowchart of computer-system processing

S2: Perform user management processing

S4: Perform information management processing

S6: Perform position management processing

S8: Perform information-distribution management

processing


Fig. 12

Flowchart of user management processing

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S20: Receive request for user-registration menu

S22: Transmit user-registration menu

S24: User-registration information received?

S26: New user?

S30: Password valid?

S28: Register user name, password, terminal name, IP
address or phone number and category information in user
master DB

S31: Register modified user-registration information in
user-information DB

S32: Report completion of user-information input
registration

S34: Request reentering of password


Fig. 13

Flowchart of information management processing

S150: Request for information-registration menu received?

S154: Provided information received?

S152: Transmit information-registration menu

S156: Check provided information and register provided
information in information-provider master DB

S158: Report completion of registration of provided
information

Fig. 14

Flowchart of position management processing

S50: Position information received?

S52: Save position information in user-location DB

S54: Infer moving direction and movement time

S56: Search area-information DB for information

corresponding to moving direction and movement time

S58: Edit information menu on the basis of information

category read out from user-information DB

S60: Transmit information menu to terminal


Fig. 15

Flowchart of information-provider management processing

S100: Selected information entered received?

S102: Extract detailed information based on selected

information from area-information DB and vehicle-

operation management DB

S104: Transmit detailed information notification to

terminal

S106: Save user response result such as selected

information category, user time and user location in user

response result master DB

S108: Analyze user favorites read out from user response

result master DB and find favorites to improve effects of

notification using priority levels of information-
providing menu and contents of provided information

S110:  Reflect favorite computation results in analysis DB


Fig. 16

Flowchart of user-terminal processing

S200:  Perform process to register terminal

S202:  Perform process to report positional information

S204:  Perform process to display information


Fig. 17

Flowchart of process to register terminal

S250:  User-registration menu requested?

S252:  Transmit request for user-registration menu to
computer system

S254:  User-registration menu received?

S256:  Display user-registration menu on display unit

S258:  User-registration information entered?

S259:  Transmit user-registration information to computer
system

S260:  User-information inputting completion notification
received?

S262:  Display user-registration result

Fig. 18 Flowchart of process to report position
information

START

Processing enclosed by this dashed line is performed
repeatedly and periodically

S300: GPS function embedded?

S302: Find own position by using GPS function

S304: Transmit position information to computer system

S306: Request mobile-communication enterprise to report
position-information to computer system


Fig. 19

Flowchart of process to display information

S320: Information menu received?

S322: Display information menu

S324: Selected information entered?

S326: Transmit selected information to computer system

S328: Detailed information received?

S330: Display detailed information


Fig. 20

Flowchart of information-provider-terminal processing

S400: Perform process to register information

S402: Perform process to change information display

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S404: Perform process to delete information


Fig. 21

Flowchart of process to register information

S420: Information-registration menu requested?

S422: Transmit request for information-registration menu to computer system

S424: Information-registration menu received?

S426: Display information-registration menu on display unit

S428: Information to be provided entered?

S430: Transmit information to be provided to computer system

S432: Notification of provided-information-inputting completion received?

S434: Display information-registration results


Fig. 22

Flowchart of process to change information display

S450: Information-display-changing menu requested?

S452: Transmit request for information-display-changing menu to computer system

S454: Information-display-changing menu received?

S456: Display information-display-changing menu on

display unit

S458: Information to be provided changed?

S460: Transmit changed information to be provided to computer system

S462: Notification of provided-information-changing completion received?

S464: Display information-display-changing results


Fig. 23

Flowchart of process to delete information

S480: Information-deleting menu requested?

S482: Transmit request for information-deleting menu to computer system

S484: Information-deleting menu received?

S486: Display information-deleting menu on display unit

S488: Deletion button pressed?

S490: Transmit deletion number of deleted information to be provided to computer system

S492: Notification of provided-information deletion completion received?

S494: Display information-deletion results


Fig. 24 Structures of data transmitted by computer system

Computer system ==> user terminal

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(a): Transmission of user-registration menu

Identification number (1)    IP address or phone number

User-registration menu

(b): Notification of completion of user-information

inputting

Identification number (2)    IP address or phone number

Completion information

0:  Normal completion

2:  Abnormal completion

(c): Transmission of information menu

Identification number (3)    IP address or phone number

information menu

(d): Notification of detailed information

Identification number (4)    IP address or phone number

Detailed information

(e): Notification of terminal information (to mobile-

communication enterprise)

Identification number (5)    IP address or phone number

Moving-destination information

Fig. 25  Structures of data transmitted by user terminal

User terminal ==> computer system

(a):  Request for user-registration menu

Requested identification number (1)

IP address or phone number

(b): User information input

Requested identification number (2)

IP address or phone number     Password

Category information

(c): Position-information notification

Requested identification number (3)

IP address or phone number

Position information (Longitude and Latitude)

Time information

(d): Selected-information input

Requested identification number (4)

IP address or phone number     Selection number

(e): Position-information notification request

Requested identification number (5)

IP address or phone number

(f): Request for service start/stop

Requested identification number (6)

IP address or phone number

Start/stop identification     Service-request level

0: Register

1: Start

2: Change

3: Stop

4: Release

0: Normal

1: Urgent


Fig. 26 Structures of data transmitted by computer system

Computer system ==> information-provider terminal

(a): Transmission of information-registration menu

Identification number (11)     IP address or phone number

Information-registration menu

(b): Notification of completion of provided-information

inputting

Identification number (12)  IP address or phone number

Completion information

0: Normal completion

1: Abnormal completion

(c): Transmission of information to be provided

Identification number (13)     IP address or phone number

Category information    Detailed information

(d): Notification of completion of modification of

information to be provided

Identification number (14)     IP address or phone number

Completion information

0: Normal completion

1: Abnormal completion

(e): Notification of completion of deletion of information to be provided

Identification number (15)    IP address or phone number

Completion information

0: Normal completion

1: Abnormal completion

(f): Transmission of information-display-changing menu

Identification number (16)    IP address or phone number

Information-display-changing menu

(g): Transmission of information-deleting menu

Identification number (17)    IP address or phone number

Information-deleting menu


Fig. 27 Structures of data transmitted by information-provider terminal

Information-provider terminal ==> computer system

(a): Request for information-registration menu

Requested identification number (11)

IP address or phone number

(b): Provided-information input

Requested identification number (12)

IP address or phone number    Password

Category information    Detailed information

(c): Request for display of information to be provided

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Requested identification number (13)

IP address or phone number    Password

Category information    Detailed information

(d):  Request for modification of information to be provided

Requested identification number (14)

IP address or phone number    Password

Category information    Information No.

Detailed information

(e):  Request for deletion of information to be provided

Requested identification number (15)

IP address or phone number    Password

Category information    Deletion No.

0: Complete deletion

1 to 999: information No.

(f):  Request for information-display-changing menu

Requested identification number (16)

IP address or phone number

(g):  Request for information-deleting menu

Requested identification number (17)

IP address or phone number


Fig. 28  Basic sequence

User terminal


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Mobile-communication enterprise

Computer system

Information-provider terminal

Registration of provided information {

.(2), (4): Request for user-registration menu

(6), (8): Transmit user-registration menu

(10), (12): User-information input

(14), (16): User-information-inputting completion
notification

User management processing

User master DB registration--> 170


Fig. 29 Basic sequence

Information-provider terminal (Mobile-terminal)

Mobile-communication enterprise

Computer system

Information-provider terminal (Stationary terminal)

Registration of provided information {

(50): Request for information-registration menu

(52): Transmit information-registration menu

(54): Provided-information input

Information-distribution management processing

(55): Information-provider master DB registration

(56): Provided-information-inputting completion

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notification

(70): Request for information-registration menu

(72): Transmit information-registration menu

(74): Provided-information input

(75): Information-provider master DB registration

(76): Provided-information-inputting completion

notification

} Registration of provided information


Fig. 30  Basic sequence

Information-provider terminal (Mobile-terminal)

Mobile-communication enterprise

Computer system

Information-provider terminal (Stationary terminal)

Modification of provided-information display {

(80): Request for information-display-changing menu

(82): Transmit information-display-changing menu

(84): Request to change provided information

Information-distribution management processing

(87): Information-provider master DB registration

(86): Provided-information modification completion

notification

(90): Request for information-display-changing menu

(92): Transmit information-display-changing menu

130

(94): Request to change provided information

(95): Information-provider master DB registration

(96): Provided-information modification completion
notification

} Modification of provided information


Fig. 31 Basic sequence

Information-provider terminal (Mobile-terminal)

Mobile-communication enterprise

Computer system

Information-provider terminal (Stationary terminal)

Deletion of provided-information display {

(100): Request for information-deleting menu

(102): Transmit information-deleting menu

(104): Request to delete provided information

Information-distribution management processing

(105): Information-provider master DB registration

(106): Provided-information-deletion completion
notification

(110): Request for information-deleting menu

(112): Transmit information-deleting menu

(114): Request to delete provided information

(115): Information-provider master DB registration

(116): Provided-information-deletion completion

131

notification

} Deletion of provided information

Fig. 32  Basic sequence

User terminal

Mobile-communication enterprise

Computer system

Information-provider terminal

(150):  Service-start request

(150):--> Position management processing

(152):  Position-information notification

(152):-->

o  Preliminarily select an information provider inferred
to be proper on the basis of the user's registration
condition and initial position information.

o  Select a plurality of inference formulas each taking
initial position information as an origin or select a
plurality of relevant inference formulas from position
information.

} o  Focus only on inference formulas extracted from
position information

o Focus only on relevant inference formulas A and B

o The terminal is determined to be moving in accordance
with inference formula A

132

(154): Transmit information menu

(156): Selected-information input

(158): Detailed-information notification


Fig. 33 Basic sequence

User terminal

Mobile-communication enterprise

Computer system

Information-provider terminal

(200): Service-start request

(200):--> Position management processing

(202): Position-information notification request

(202):-->

o Preliminarily select an information provider inferred to be proper on the basis of the user's registration condition and initial position information.

o Select a plurality of inference formulas each taking initial position information as an origin or select a plurality of relevant inference formulas from position information.

} o Focus only on inference formulas extracted from position information

o Focus only on relevant inference formulas A and B

o The terminal is determined to be moving in accordance

133

with inference formula A

(204): Transmit information menu

(206): Selected-information input

(208): Detailed-information notification


Fig. 34  User-registration screen

<< User-registration menu >>

User name    ABC

Password     ******

V  Traffic information

V  Shopping information

V  Event information

   Restaurant information

              LIST   URGENT

REGISTER  CANCEL  SERVICE  HELP


Fig. 35  User-registration completion screen

**  User registration has been completed

SERVICE  HELP

Screen after user registration


Fig. 36  Select menu screen for information providers

<< Select menu >>

1:  information registration

2:  information displaying and changing

3:  information deletion

SERVICE  HELP

Select menu screen

Fig.  37  Information-registration screen

<< Information-registration menu >>

User name   ABC

Password     ******

   Traffic information

V  Shopping information

   Event information

   Restaurant information

              LIST

REGISTER  CANCEL  SERVICE  HELP

Information-registration menu screen (Category inputting)

Fig.  38  information menu screen

<< information menu >>

1:  Traffic information

2:  Train and bus information

3:  Shopping information

4:  Event information

5:  Entertainment information

SERVICE  HELP


Fig. 39  Information-registration screen

<< Information-registration menu >>

Shopping information

No. 1

Today, at OO shopping center, XX products are put on

sales only for 100 customers on first-come, first-served

basis.

Address:  1-1-1  □□ town, △△ city

Phone:  xxx-yyy-zzzz

<--Enter information here

                LIST

REGISTER  CANCEL  SERVICE  HELP

Information-registration menu screen (Detailed-

information inputting)


Fig. 40  Information-registration completion screen

**  information registration has been completed.

SERVICE  HELP

Screen after information registration


Fig. 41  Information-display-changing screen

<< Information-display-changing menu >>

User name   ABC

Password    ******

        Traffic information

        Shopping information

        Event information

        Restaurant information

                LIST

DETERMINE   CANCEL   SERVICE   HELP

Information-displaying screen (Category selection)


Fig. 42  Information-display changing screen

<< Information-display changing menu >>

Shopping information

No. 1

Today, at OO shopping center, XX products are put on

sales only for 100 customers on first-come-first-served

basis.

Address:  1-1-1  □□ town, △△ city

Phone:  xxx-yyy-zzzz

                LIST

CHANGE   CANCEL   SERVICE   HELP

Information-displaying screen (Detailed-information

display)

Fig. 43 information modification completion screen

** information modification has been completed.

SERVICE HELP

Screen after information modification


Fig. 44 information deletion screen

<< information deletion menu >>

User name ABC

Password ******

Traffic information

Shopping information

Event information

Restaurant information

LIST

DETERMINE CANCEL SERVICE HELP

Information deletion screen (Category selection)


Fig. 45 information deletion screen

<< information deletion menu >>

Shopping information

No. 1

Today, at OO shopping center, XX products are put on

sales only for 100 customers on first-come-first-served

basis.

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Address:  1-1-1  □□ town,  △△ city

Phone:  xxx-yyy-zzzz


LIST

DELETE  CANCEL  SERVICE  HELP

Information deletion screen (Detailed-information

deletion)


Fig. 46  information deletion screen

<< information deletion menu >>

Shopping information

No. 1

Today, at OO shopping center, XX products are put on

sales only for 100 customers on first-come-first-served

basis.  .

Address:  1-1-1  □□ town,  △△ city

Phone:  xxx-yyy-zzzz

Deletion of No. 1

Deletion of all

LIST

DELETE  CANCEL  SERVICE  HELP

Information deletion screen (Detailed-information

deletion)

.

139

Fig. 47 Information-deletion completion screen

** information deletion has been completed.

SERVICE HELP

Screen after information deletion


Fig. 48 Inference mechanism

B (Allowable value)   Inference upper limit $(y = ax + b)$

Inference formula $(y = ax)$

Inference lower limit $(y = ax-b)$

T (Time)

Range of allowable displacements

* If the value changed within the range between the upper

and lower limits of the inference 3 times consecutively

in a row (or 3 times in a predetermined period of time),

==> it is possible to infer that the terminal (or the

user) has been moving in a direction conforming to the

inference formula (through a route of A0--> A1--> A2).

==> A movement of B0--> B1--> B2--> B3 cannot be judged

to be a movement conforming to the inference formula (A

displacement of B2--> B3 between times t2 and t3 can be

inferred as a stationary state).


Fig. 49 Inference mechanism for curved roads

Actual road

Inference formula derived from P0, P1, P2, P3 and P4

Inference formula y = a3x + b3 defined from P2, P3 and P4

Inference formula y = a2x + b2 defined from P1, P2 and P3

Inference formula y = a3'x + b3' defined from P0, P1 and
P3'

Inference formula y = a1x + b1 defined from P0, P1 and P2


Fig. 50 Inference mechanism for grid-like roads

Moving along grid-like road through points P0, P1, P2, P3,
P4 and P5

Actual road

Inference formula derived from P0, P1, P2, P3, P4 and P5
by application of partial derivative

Defined allowable range


Fig. 51 For user's request for urgent transmission of
information to be provided

172: User registration service category master DB

280: User present location DB

290: Information-provider location DB

212: Registration-information-category master DB

272: Information-provider-candidate extraction
determination processing unit

292: Candidate information-provider DB

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274: Information-provider determination processing unit
(Determination of an information provider existing in a
circular area having the present position of the user as
its center by varying the radius of the area in
accordance with the level of a request made by the user)
294: Information-provider DB for distributing information
to be provided
150: User-interface processing unit
306: Information-distribution execution processing unit
304: Information-distribution processing management unit
314: Distribution log DB


Fig. 52 Bank financial-settlement sequence
(a): information-provider terminal is not mobile terminal
(from top, from left)
  User
  Mobile network
  ASP
  information provider
  (Financial transaction institution)
  (Financial transaction institution)
  (Financial transaction institution)
  (Financial transaction institution)
  Billing notification (By mail in some cases)

User monthly fee billing

Information-provider monthly fee billing (Including additional registration fee for first month after registration)

(Inter-bank settlement (transaction))

<--Payment demand

<--Payment demand

Payment demand-->

Payment-->

Payment-->

<--Payment


(b): information-provider terminal is mobile terminal (from top, from left)

User   information provider

Mobile network

ASP

(Financial transaction institution)

(Financial transaction institution)

(Financial transaction institution)

(Financial transaction institution)

Billing notification (By mail in some cases)

User monthly fee billing

Information-provider monthly fee billing

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Billing notification (By mail in some cases)

<--Payment demand

Payment demand (to user)

(Inter-bank settlement (transaction))

<--Payment demand

Payment demand (to information provider)

Payment-->

Payment-->

Payment-->

Payment-->


(c): ASP also does network banking and user has network-bank account

(from top, from left)

User

Mobile network

ASP

information provider

(Financial transaction institution)

Network bank

(Financial transaction institution)

(Financial transaction institution)

Billing notification (By mail in some cases)

User monthly fee billing

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Information-provider monthly fee billing

<--Payment demand

Payment demand-->

Payment demand-->

<--Payment

(Inter-bank settlement (transaction))

<--Payment

<--Payment

Payment-->


Fig. 53 information distribution service system

implemented by first embodiment of present invention

6#1:  Terminal

6#2:  GPS terminal

6#3:  Terminal

4#1:  Terminal

4#2:  Terminal

4#4:  Terminal

8c:  Mobile-communication network

8b:  IP network

2:  Computer system

8d:  Enterprise network


Fig. 54  Detailed-information screen

<< Detailed shopping information >>

Nakahara department store

1: Today's buying at bargain

2: Seasonal-bargain information

3: Coupons

SERVICE  HELP

Detailed-information screen


Fig. 55  Detailed-information screen

<< Detailed traffic information >>

Traffic jam at distance of 5 km from Youga

SERVICE  HELP

Detailed-information screen


Fig. 56  information distribution service system
implemented by second embodiment of present invention

6#1:  Terminal

6#2:  GPS terminal

6#3:  Terminal

4#1:  Terminal

4#2:  Terminal

4#4:  Terminal

8c:  Mobile-communication network

8b:  IP network

450: Computer system

8d: Enterprise network

Fig. 57 Computer system of information distribution service system shown in Fig. 56

12: Execution processing unit

20: User management unit

460: Position management unit

24: information management unit

25: Information-distribution management unit

14: Communication processing unit

16: Storage unit

26: User-information DB

28: User-location DB

30: Information-provider DB

32: Area-information DB

34: Inferred-information DB

35: Analysis DB

Fig. 58

Flowchart of position management processing

S600: Position information received?

S602: Save position information in user-location DB

S604: Infer moving direction and movement time

S606: Moving destination (map code) and terminal address to be transmitted to communication enterprise?

S608: Transmit destination (map code) and terminal address to communication enterprise

S610: Search area-information DB for information corresponding to moving direction and movement time

S612: Edit information menu on the basis of information category read out from user-information DB

S614: Transmit information menu to terminal

Fig. 59 User sequence

User terminal    Mobile-communication enterprise

Computer system    Information-provider terminal

(250): Service-start request

(250):--> Position management processing

(252): Position-information notification

(252):-->

o Preliminarily select an information provider inferred to be proper on the basis of the user's registration condition and initial position information.

o Select a plurality of inference formulas each taking initial position information as an origin or select a plurality of relevant inference formulas from position information.

} o  Focus only on inference formulas extracted from

position information

o  Focus only on relevant inference formulas A and B

o  The terminal is determined to be moving in accordance

with inference formula A

(254):  Terminal-information notification

Transmit terminal's phone number or IP address and moving

destination (map code)

(256):  Notification from mobile communication enterprise


Fig. 60  information distribution service system

implemented by third embodiment of present invention

6#1:  Terminal

6#2:  GPS terminal

6#3:  Terminal

4#1:  Terminal

4#2:  Terminal

4#4:  Terminal

8c:  Mobile-communication network

8b:  IP network

500:  Computer system

8d:  Enterprise network


Fig. 61  Computer system of information distribution

service system shown in Fig. 60

12:  Execution processing unit

20:  User management unit

510:  Position management unit

24:  information management unit

25:  Information-distribution management unit

14:  Communication processing unit

16:  Storage unit

26:  User-information DB

28:  User-location DB

30:  Information-provider DB

32:  Area-information DB

34:  Inferred-information DB

35:  Analysis DB


Fig. 62

Flowchart of position management processing

S700:  Position information received?

S702:  Save position information in user-location DB

S704:  Infer moving direction and movement time

S706:  Moving direction to be compared with vehicle (such as train or bus)?

S708:  Moving direction match?

S714:  Search area-information DB for information

150

corresponding to moving direction and movement time

S716: Edit information menu on the basis of information category read out from user-information DB

S718: Transmit information menu to terminal

S710: Identify vehicle taken by user and edit menu based on combination of information retrieved from area-information DB and information on operations of vehicle

S712: Transmit information menu to terminal


Fig. 63 Detailed-information screen

<< Detailed information on trains and buses >>

The next station is Musashi Nakahara.

Will arrive at Kawasaki terminal at 12:00.

1: information on change to another train at Kawasaki station

2: information on change to another train at Musashi Kosugi station

SERVICE HELP

Detailed-information screen


Fig. 64 information distribution service system implemented by fourth embodiment of present invention

6#1: Terminal

6#2: GPS terminal

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6#3:  Terminal

4#1:  Terminal

4#2:  Terminal

4#4:  Terminal

8c:  Mobile-communication network

8b:  IP network

550:  Computer system

8d:  Enterprise network


Fig. 65  Computer system of information distribution service system shown in Fig. 64

12:  Execution processing unit

20:  User management unit

560:  Position management unit

24:  information management unit

25:  Information-distribution management unit

14:  Communication processing unit

16:  Storage unit

26:  User-information DB

28:  User-location DB

30:  Information-provider DB

32:  Area-information DB

34:  Inferred-information DB

35:  Analysis DB

Fig. 66

Flowchart of position management processing

S800:  Position information received?

S802:  Save position information in user-location DB

S804:  Infer moving direction and movement time

S806:  Moving means to be identified?

S808:  Determine whether user is walking or riding on vehicle

S810:  Search area-information DB for information corresponding to moving direction and movement time

S812:  Edit information menu on the basis of information category read out from user-information DB

S814:  Transmit information menu to terminal


Fig. 67  Detailed-information screen

<< Detailed information on resort >>

Vicinity of Nakahara beach

1:  information on parking lots

2:  information on seaside houses

3:  information on restaurants

SERVICE  HELP

Detailed-information screen

Fig. 68 information distribution service system implemented by fifth embodiment of present invention

6#1: Terminal

6#2: GPS terminal

6#3: Terminal

4#1: Terminal

4#2: Terminal

610: Store management system

620: Store management system

4#4: Terminal

8c: Mobile-communication network

8b: IP network

600: Computer system

8d: Enterprise network

Fig. 69 Computer system of information distribution service system shown in Fig. 68

12: Execution processing unit

20: User management unit

22: Position management unit

24: information management unit

650: Information-distribution management unit

14: Communication processing unit

16: Storage unit

26: User-information DB

28: User-location DB

30: Information-provider DB

32: Area-information DB

34: Inferred-information DB

35: Analysis DB


Fig. 70  Information-distribution management unit of computer system shown in Fig. 69

(Response)--> 150

150: User-interface processing unit

350: Distributed-information user response reception processing unit

310: Target-user DB

314: Distribution log DB

284: User location displacement DB

312: Distribution information-provider DB

378: User response result master DB

352: User analysis processing unit

354: Information-provider analysis processing unit

700: User-displacement-speed computation processing unit

702: Inferred-distance computation processing unit

704: Estimated-arrival-time computation processing unit

380: User analysis log DB

384: Response-attribute analysis log DB

750: Inferred-user-arrival-time DB

680: Response-result-edit processing unit

682: Response-result-notification processing unit

722: Response-result DB

200: Information-provider interface processing unit

200:--> (Response notification)

200: <--(Response)

750:--> (Response notification)

716: Response-notification execution processing unit

714: Response-notification processing management unit

712: Response edit processing unit

710: Information-provider response reception processing unit

754: Response log DB

752: Information-provider response master DB


Fig. 71 Store management system of information distribution service system shown in Fig. 68

Response notification--> 800

800: Information-processing apparatus

802: Display-unit-driving control apparatus

804: Parking lot display unit

806: Seat display unit

808: Kitchen display unit

810: Staff-room display unit

Displayed information includes:

o The name of user (the person making reservation) and number of people in party.

o An expected time of arrival of user

o A menu of foods reserved by user


Fig. 72 Store management system of information distribution service system shown in Fig. 68

Store management system

Response notification--> 820

820: Sales management processing system

822: Inventory management system

824: POS management system


Fig. 73 User sequence

User terminal . Mobile-communication enterprise

Computer system    Information-provider terminal

(300): Service-start request

(300):--> Position management processing

(302): Position-information notification request

(302):-->

o Preliminarily select an information provider inferred

to be proper on the basis of the user's registration
condition and initial position information.

o  Select a plurality of inference formulas each taking
initial position information as an origin or select a
plurality of relevant inference formulas from position
information.

} o  Focus only on inference formulas extracted from
position information

o  Focus only on relevant inference formulas A and B

o  The terminal is determined to be moving in accordance
with inference formula A

(304):  Transmit information menu

(306):  Selected-information input

(308):  Detailed-information notification

(310):  Response

(312):  Response notification

(314):  Response

(316):  Response notification